



**ANALYTICAL RESULTS REPORT
SITE INSPECTION**

**GOLD HILL TAILINGS SITE
EPA ID# COD983801275**

Prepared for:

**U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VIII**

**CONTRACT NO. 68-W9-0025
WORK ASSIGNMENT NUMBER 28-8JZZ**

October 14, 1994



MORRISON KNUDSEN CORPORATION
Engineering, Construction & Environmental Group
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APPROVAL PAGE

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MK TASK LEAD

10-14-94

DATE



MK ARCS PRE-REMEDIAL MANAGER

10/14/94

DATE



EPA SITE ASSESSMENT MANAGER

11/28/94

DATE

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1.0 INTRODUCTION

This Analytical Results Report (ARR) is prepared in partial fulfillment of work assignment number 28-8JZZ issued to Morrison Knudsen Corporation (MK) by the Region VIII office of the U.S. Environmental Protection Agency (USEPA) under ARCS Contract Number 68-W9-0025. This ARR has been prepared as part of a Site Inspection of the Gold Hill Tailings Site (EPA ID# COD983801275) located in Colorado Springs, El Paso County, Colorado.

2.0 SITE DESCRIPTION

The Gold Hill Tailings Site is located in Colorado Springs, Colorado adjacent to the foothills northwest of the downtown area. The tailings pile is 170 acres in size and covers most of the east half of Section 14 and portions of the western edge of Section 13, T. 14 S., R. 67 W (see Figure 1). The site is bounded by Fountain Creek and Highway 24 (Midland Expressway) on the north, 21st Street on the west, Rio Grand Street and Moreno Avenue on the south, and residential areas on the east including the A-1 Mobile Village (see Figure 3).

The tailings were produced by milling ore primarily originating from the Cripple Creek Mining District in Colorado. A total of 14.3 million tons of ore were processed yielding 12.5 million tons of tailings. Gold ore from Cripple Creek mines was transported by the Midway Railroad Company to the Golden Cycle Mill, which operated at the Gold Hill Tailings site from prior to 1904 until 1949. This mill processed ore using bromide, roasting, cyanide and flotation processes. Mill operations were modified for the war effort during 1942 and 1943. Flotation units at the mill were converted to process zinc-lead ores from other mineralized areas of Colorado. Zinc concentrates from the mill were shipped to other facilities for further processing. Additional description of the mill processes is provided in the Preliminary Assessment (MK, 1994) (GCC, 1942; GCC, 1943; Harner, 1933, Mosconi, 1952; The Westside).

By February, 1949 mill operations ceased. The mill was dismantled throughout 1950. Mill equipment and supplies that could not be used in the new Carlton Mill, constructed by the Golden Cycle Corporation in the Cripple Creek Mining District, were sold for scrap. By 1950 approximately 357,440 tons of dirt from hills adjacent to the mill was used to

cover the 170-acre tailings pile to a depth of 6 to 8 inches (Bixler, 1987; Aguillar, 1992; Belgum, 1988; GCC, 1947; GCC, 1948; GCC, 1949; GCC, 1950).

The land on which the site is located has been divided into numerous parcels that are currently owned by the Fountain Creek Corporation of Seattle, Washington. Previous landowners of parcels at the site are shown in Table 1. In May, 1994 MK collected soil samples at the site and in the adjacent A-1 Mobile Village, and surface water and sediment samples from Fountain Creek upstream, downstream and adjacent to the site. Sampling locations and observations are detailed in the Sampling Activities Report (Appendix A).

The site is underlain by the Pierre Shale Formation. The thickness of the Pierre Shale ranges from 3,555 to 5,290 feet in the Denver Basin. The southwest edge of the Denver Basin lies a few miles northeast of the site. Surficial geologic maps indicate that Fountain Creek, upstream and downstream from the site, is underlain by the Piney Creek Alluvium. Louvier's Alluvium is found on terraces above Fountain and Monument Creeks, but is absent above the south side of Fountain Creek on Gold Hill Mesa (USGS, 1979a).

3.0 DATA USABILITY

Soil, sediment and surface water samples were analyzed under RAS CLP protocols for Target Analytical List total metals and cyanide. Analytical results were validated by the ESAT contractor, according to CLP Data Validation Functional Guidelines. The laboratory data sheets and data validation summaries are included in Appendix B. The quality assurance review indicated that the analytical data are acceptable with the qualifications noted below. Adjusted values were calculated according to the potential bias indicated by the quality control criteria and quality assurance review.

Soil/Sediment Sample Data

The cyanide concentration in soil sample GH-SO-5 is considered an estimate because analysis for this compound was not performed within the 14-day holding time, which may result in a low bias of the reported value. The antimony, barium, copper and vanadium concentrations detected in all of the soil and sediment samples are considered estimates because matrix spike recoveries were below control limits and associated sample results may be biased low. The sodium and zinc concentrations detected in all of the soil and

sediment samples are considered estimates because serial dilutions were outside of established control limits, indicating a possible low bias of the reported values.

The quality control issues impact the usability of the data set to document antimony, barium and sodium as waste characteristics and to document elevated barium and sodium in residential soils. Sediment data usability is not significantly affected.

Aqueous Sample Data

The arsenic concentration detected in GH-SW-8 is considered an estimate because of negative blank contamination; however, the value still documents elevated arsenic in the surface water sample. All of the iron concentrations in aqueous samples are considered estimates because matrix spike recoveries were below control limits, but downstream concentrations are comparable to those upstream and all reported values are less than the contract required detection limit. The barium concentrations detected in these samples are considered estimates because serial dilutions were outside of established control limits. The quality control issues do not affect the usability of the data to document releases to the surface water.

Field QC Samples

The rinse blank documents adequate decontamination and no apparent cross-contamination between sample locations. The results of field duplicates indicate poor laboratory precision for several aqueous parameters, including arsenic, lead, manganese, and zinc. The release of arsenic indicated by the aqueous sample may be questioned, although sediment samples support the presence of relatively high arsenic levels in the creek.

4.0 WASTE CHARACTERISTICS

Ores sent to the Golden Cycle Mill are classified as sulfo-telluride ores. The gold is present in iron sulfide or pyrites, and in gold, silver tellurides of calaverite and sylvanite. Ores were processed at the mill with cyanide, mercury, zinc dust and shavings, lead acetate, sulfuric acid, hydrochloric acid, hydrated lime and sodium nitrate (Harner, 1933).

Metals and cyanide are the primary contaminants at this site. Onsite waste sources include the tailings pile, contaminated soils and building foundations in the mill site area,

and tailings eroded from the pile onto land along Fountain Creek and within A-1 Mobile Village.

Soil samples GH-SO-3, GH-SO-4 and GH-SO-8 were collected from the millsite area. GH-SO-3 was collected in the former sand leach tank area of the millsite. GH-SO-4 and GH-SO-8 were collected in the former slime room area of the millsite (see Figure 3). Inorganic results for the background and millsite area soil samples are shown in Table 2. Mercury and cyanide were detected in all of the millsite area samples, but not in the background samples. Concentrations of twelve additional metals were elevated in the millsite area relative to background levels. Concentrations of several analytes were quite high relative to background levels including arsenic at 385 mg/kg, lead at 1,630 mg/kg, mercury at 4.7 mg/kg, zinc at 3,720 mg/kg and cyanide at 393 mg/kg. GH-SO-9 was collected from a dry basin north of the millsite area and contained elevated levels of manganese and mercury.

Soil samples GH-SO-5 and GH-SO-6 were collected at or near the base of the northeast face of the tailings pile. Soil sample GH-SO-7 was collected from an exposed soil face above the south bank of Fountain Creek in the northwest corner of the site. Soil samples GH-SO-10 through GH-SO-12 were collected from visible areas of tailings deposition within the northwest portion of A-1 Mobile Village (see Figure 4). Results for these samples are shown in Table 3. Cyanide and eight of the fourteen metals found to be elevated at the millsite/basin areas also were elevated along the northeast face and/or Fountain Creek bank. Each of the three samples collected from the A-1 Mobile Village contained elevated concentrations of arsenic, lead, silver and cyanide, with mercury and copper elevated in two of the samples.

The analytical results of the ten source characteristics samples document significant levels of metals and cyanide associated with the tailings pile extending north to the creek. Additionally, metal- and cyanide-laden tailings extend beyond Fountain Creek Corporation's northeastern property boundary and onto the adjacent residential area.

5.0 SOIL EXPOSURE PATHWAY

All soil/waste samples were collected within one-foot of the surface. The analytical results document contaminant sources, as presented in Section 4.0. The millsite area and tailings cover approximately 733,000 square feet. The area of tailings and associated contaminated soil beyond the site property boundary covers a minimum area of 9,636 square feet, as documented by soil samples GH-SO-10, GH-SO-11 and GH-SO-12.

Portions of the site along Fountain Creek are fenced. There is no fencing or other barriers to prevent access to other areas of the site. There is no fence between the site and the A-1 Mobile Village and children from A-1 Mobile Village were observed playing in the tailings deposition area below the northeast face of the tailings pile. Tailings from the northeast face have eroded into the northwest portion of A-1 Mobile Village. There are 24 trailers with a total of 69 residents located within 200 feet of the sample locations in A-1 Mobile Village (see Figure 4). A summary of the trailers and residences within 200 feet is presented in Table 4. Numerous dirt roads and trails cross the site, which is used for recreational trail riding. Youths were also observed in the millsite area (MK, 1994; Aerial Surveys, Inc., 1989).

The Bristol, Buena Vista, Midland and Washington elementary schools lie within one mile of the site. The enrollments of these schools are 339, 324, 205 and 234 students, respectively. The West Junior High School located at 1920 West Pikes Peak, is also within one mile of the site has an enrollment of 637 students. The location of these schools are shown in Figure 2. The populations for the target distance categories within one mile of the site are presented in Section 4.5 (Burkman, 1993; USGS 7.5' Colorado Springs quadrangle map).

6.0 SURFACE WATER MIGRATION PATHWAY

The north and northeast portions of the tailings pile slope toward Fountain Creek. The northeast face of the tailings pile is eroding into the west edge and northwest portion of A-1 Mobile Village, located downslope and to the east of the pile. This large depositional area also extends into Fountain Creek. The southeast and southwest portions of the pile slope toward the east and southwest, respectively. Bear Creek, located south of the site, is the nearest surface water body to the southeast part of the tailings pile. Bear Creek empties into Fountain Creek approximately 0.4 miles downstream from Fountain

Creek/Monument Creek confluence (USGS, Colorado Springs quadrangle map; Aerial Surveys, 1989; Kucera & Associates, 1969; Landis Aerial Photographs, 1981, 1983, 1985 and 1987; MK, 1994).

Surface water and sediment samples were collected from three locations adjacent to the tailings pile. Aqueous samples contained metals concentrations comparable to those upstream of the site, with the exception of an arsenic detection in GH-SW-8. Sediment samples GH-SE-2 and GH-SE-3 contained numerous metals at levels significantly elevated relative to the upgradient sediment sample. Of these sixteen metals, the following also have been established as characteristic of the onsite sources: aluminum, arsenic, beryllium, cadmium, copper, iron, lead, manganese, mercury, silver, vanadium, and zinc. Cyanide also has been released to Fountain Creek sediment.

Sediment sample GH-SE-8 was collected where a channel draining alternate sources enters Fountain Creek. Concentrations of several analytes were higher in GH-SE-8 than were reported for sediment sample GH-SE-4 collected upgradient of this channel. It is possible that GH-SE-4 was not representative of the sediments downgradient of the site. Or, it is possible that the channel is contributing similar heavy metals and cyanide to Fountain Creek. Sample GH-SE-6 was collected to test for impacts to the nearest downstream wetland. The results of this sample and of those collected just upgradient of the wetland indicate no significant impact to the wetland as a result of the tailings site.

Eleven wetland segments have been identified along Fountain Creek within 12 downstream miles of the site. A summary of these wetlands, which meet the criteria for wetlands defined in 40 CFR 230.3, is shown in Table 7 (USF&WS, 1975; USGS, 1979b; MK, 1994).

There are no drinking water intakes in Fountain Creek within 15 downstream miles of the site. Water is withdrawn from Fountain Creek and used for irrigation purposes. The closest diversion point downstream from the site is about 2.5 miles to the east-southeast in the Fountain Mutual Canal, which originates from a headgate on Fountain Creek. The segment of Fountain Creek downstream from the site is not a fishery. No state- or federally-designated threatened or endangered species habitats are known to exist in Fountain Creek. Bald eagles occasionally migrate through the area in winter (McGrady, 1993; Price, 1993; Flory, 1993; Loeffler, 1993).

7.0 GROUND WATER MIGRATION PATHWAY

The City of Colorado Springs obtains potable water from various surface water sources including reservoirs on the slopes of Pikes Peak and Fountain Creek upstream from the site. The city also enforces a municipal ordinance requiring city residents to use city water for drinking. The City of Colorado Springs Utilities Department verified that all addresses with water rights for private domestic wells also receive city water. The City of Manitou Springs obtains potable water from a reservoir on the west side of Pikes Peak and from French Creek (Dagmar, 1993; McGrady, 1993; Price, 1993).

The nearest known drinking water wells to the site are located 3.3 to 3.8 miles to the southeast and are used by the Garden Valley Water & Sanitation District. The District provides water to an estimated 600 residents and 300 workers from 7 wells. The wells are 60 to 65 feet deep and screened in alluvium. No other drinking water wells within the 4-mile target distance limit have been identified (CDH, 1992).

8.0 AIR MIGRATION PATHWAY

The tailings pile originally was covered in 1949 with 6 to 8 inches of dirt from the surrounding hills. Most of the soil cover on the northeast face of the tailings pile has eroded away exposing tailings material (GCC, 1949; MK, 1994; Aerial Surveys, 1989; Kucera & Associates, 1969; Landis, 1981, 1983, 1985 and 1987). No direct observation of wind-blown tailings was made during the SI field event.

The potential target populations for the air migration pathway were calculated by estimating the proportion of each census tract within each distance category and multiplying that proportion by the total population for each tract as given in the 1990 Census of Population and Housing for Colorado. The census tract areas included within each distance category were estimated by examining topographic maps. The estimated population for each distance category is given below:

0 to ¼ Mile:	2,237
¼ to ½ Mile:	2,449
½ to 1 Mile:	6,616
1 to 2 Miles:	22,991
2 to 3 Miles:	23,476
3 to 4 Miles:	27,578

The American Peregrine Falcon, a federally-designated endangered species, is known to breed in the Bear Creek Canyon area, which is within two miles southwest of the site. Bald eagles occasionally migrate through the area during the winter. The Mexican Spotted Owl, a federally-designated threatened species, is known to occur in areas immediately south of Colorado Springs. This species may be present in wooded canyons 3½ to 4 miles west of the site. Bear Creek Regional Park is located less than ½ mile to the south-southeast of the site (Loeffler, 1993; MacVan, 1993).

9.0 SUMMARY

The Gold Hill Tailings site consists of 170 acres of tailings produced by the Golden Cycle Millsite, which operated from 1905 or earlier until 1949. The mill was dismantled in 1950. Gold recovery processes used at the mill included amalgamation, cyanidation, cyanide sand leaching and cyanide slime leaching. Lead acetate, sulfuric acid, hydrochloric acid, hydrated lime, sodium nitrate and zinc shaving and zinc dust were used to aid in the precipitation from leaching solutions.

Most of the ore processed at the Golden Cycle Mill was silicious or basic ore from the Cripple Creek Mining District that contained small amounts of silver, lead, copper, zinc, arsenic, antimony and mercury. The mill also processed some complex sulfide ores from other mining districts in Colorado. Mill operations were modified in World War II in order to process zinc-lead ores for the war effort.

Cover material, which was placed on the tailings pile in 1949, has eroded to expose tailings material on the northeast face. Tailings from the northeast face of the tailings pile have migrated onto the A-1 Mobile Village property. Soil samples collected in May, 1994 from the millsite area, the northeast face of the tailings pile, and within the northwest portion of A-1 Mobile Village contained cyanide and numerous heavy metals, including elevated arsenic, copper, lead, mercury, silver concentrations relative to offsite background soil samples. The site is accessible and is used for recreational purposes. There are 24 trailers with a total of 69 residents present within 200 feet of the sample locations in A-1 Mobile Village. There are four elementary schools and one junior high school within one mile of the site with a combined enrollment of 1,739 students. An estimated 11,302 people reside within one mile of the site. An estimated 85,347 people within four miles of the site are potential targets of airborne releases.

Sediment samples collected from Fountain Creek adjacent to the site contained elevated levels of twelve heavy metals and cyanide. Downstream samples indicate that the levels are substantially reduced within ½ mile and that the nearest wetland is not impacted by site run-off.

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Fountain, Colorado
Manitou Springs, Colorado
Pikeview, Colorado

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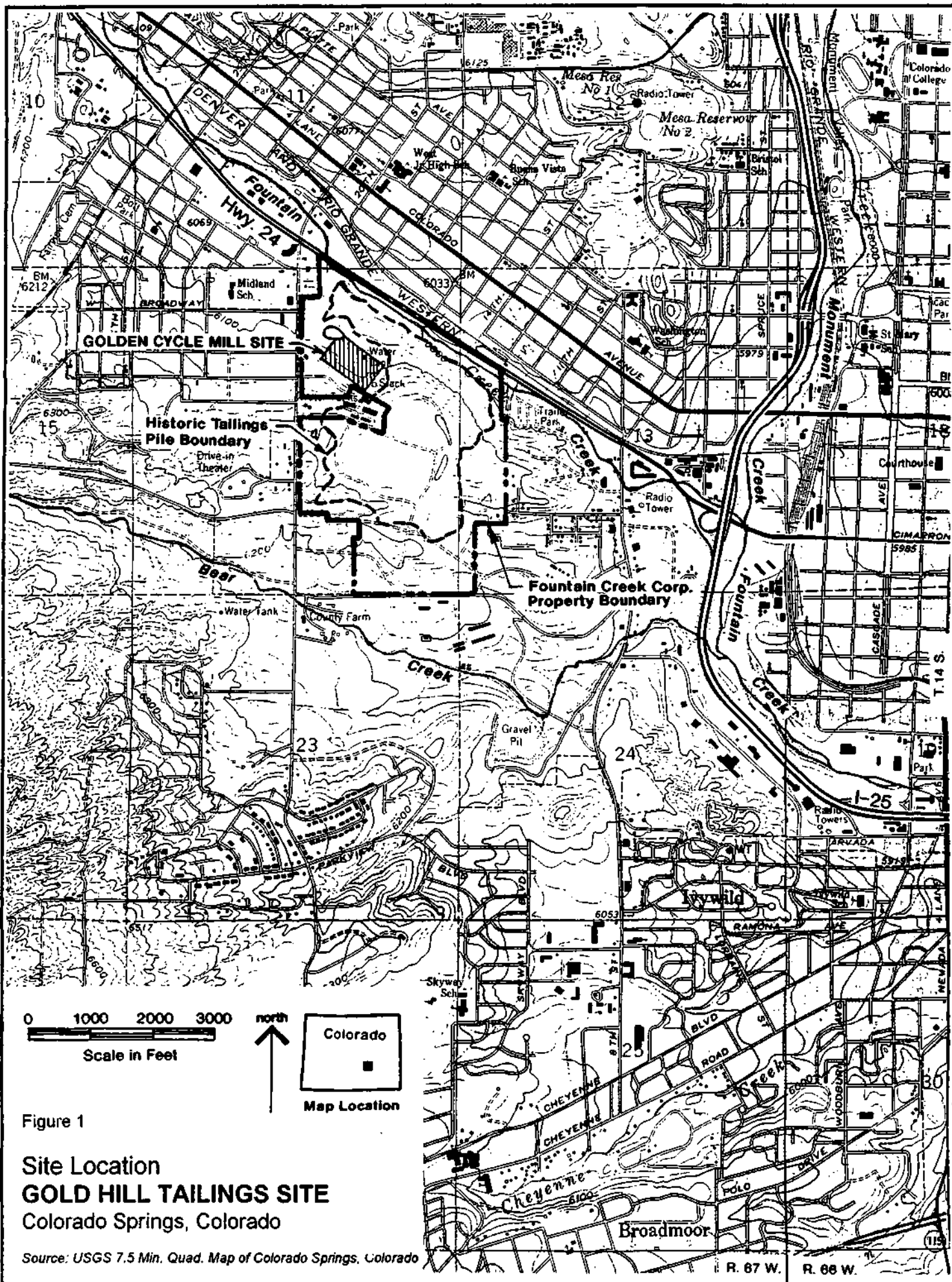
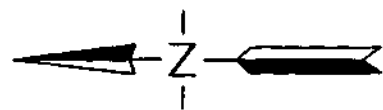




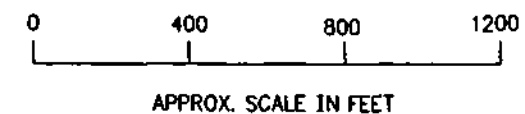
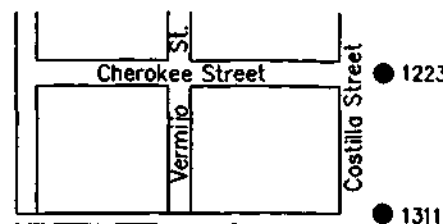
Figure 2

Stream Sampling Locations GOLD HILL TAILINGS SITE Colorado Springs, Colorado

Source: USGS 7.5 Min. Quad. Map of Colorado Springs, Colorado

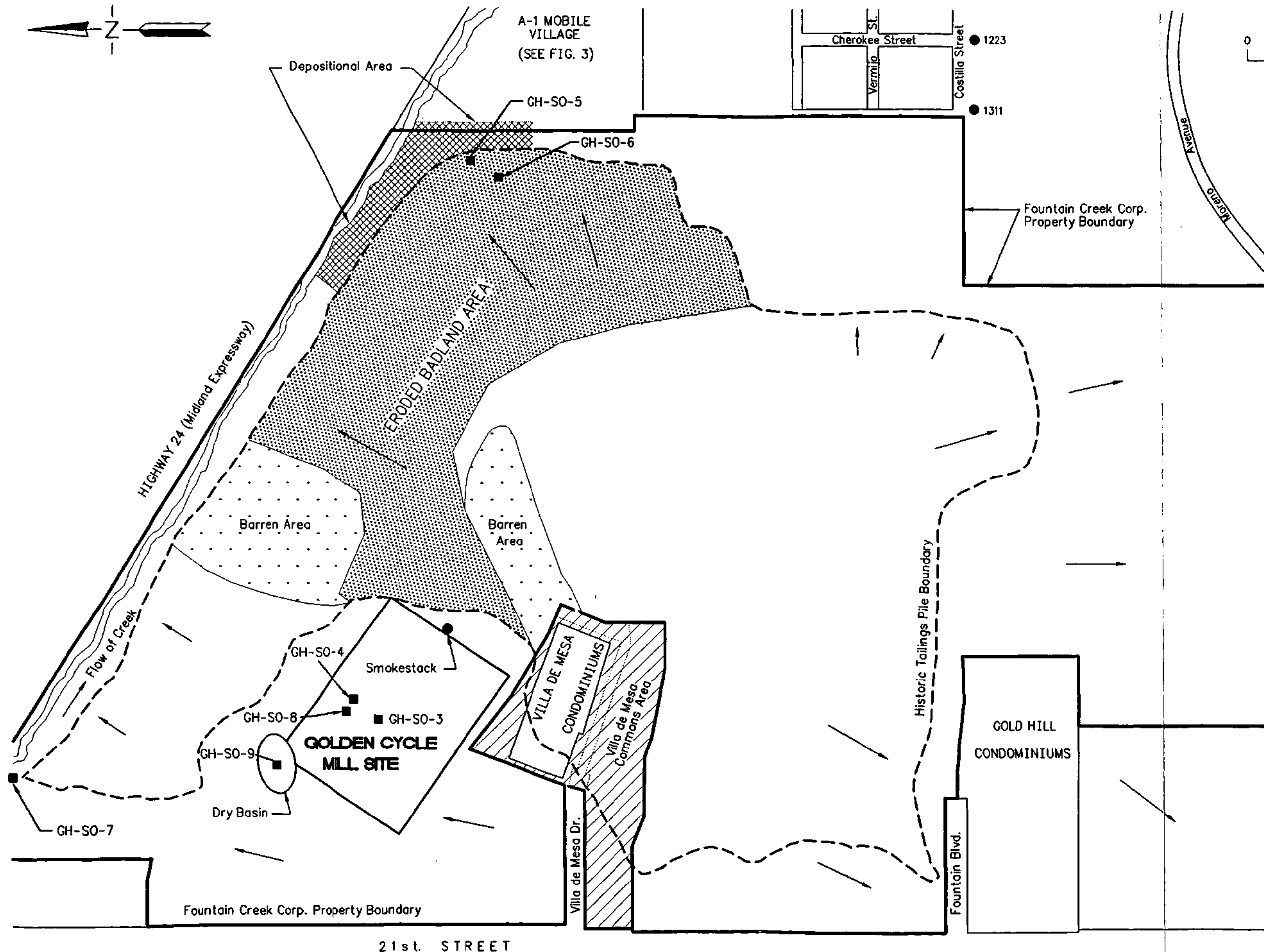


A-1 MOBILE VILLAGE
(SEE FIG. 3)



LEGEND

- Slope and Flow Direction
- "Certificate of Designation" Site
1223
- Sample Location
GH-SO-3



SOURCES:

Sanborn Map, El Paso Co. Assessor's Office, Aerial Survey Inc, Lovejoy

GOLD HILL TAILINGS SITE
Colorado Springs, Colorado

Figure 3
ON SITE SAMPLE LOCATIONS

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP
DENVER, COLORADO

SCALE: As Noted	DATE	WORK ORDER NUMBER	11
DRAWN: SS	6/8/94	3780	17
DESIGNED: ML	6/8/94	DRAWING NUMBER	REV
CHECKED: MG	6/8/94	2809-08	A
CADD FILE NAME: 2157004A.DWG			

Figure 4

**OFFSITE SAMPLE LOCATIONS
IN NORTHWEST PART
A-1 MOBILE VILLAGE**

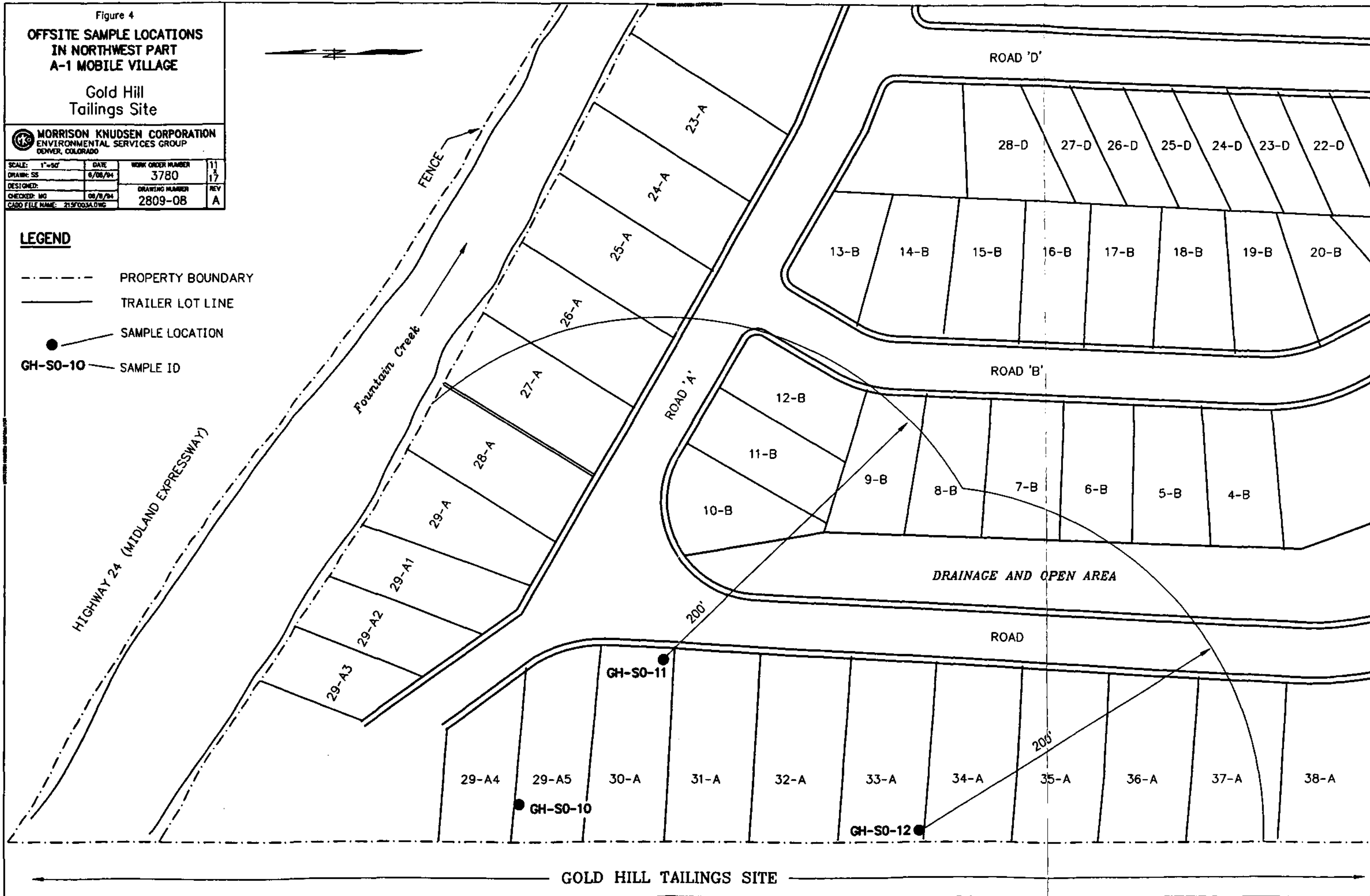
Gold Hill
Tailings Site

MORRISON KNUDSEN CORPORATION
ENVIRONMENTAL SERVICES GROUP
DENVER, COLORADO

SCALE: 1"=50'	DATE: 6/06/94	WORK ORDER NUMBER: 3780	11
DRAWN: SS			17
DESIGNED: MC		DRAWING NUMBER: 2809-08	REV: A
CADD FILE NAME: 2157003A.DWG			

LEGEND

- PROPERTY BOUNDARY
- TRAILER LOT LINE
- SAMPLE LOCATION
- GH-S0-10 SAMPLE ID



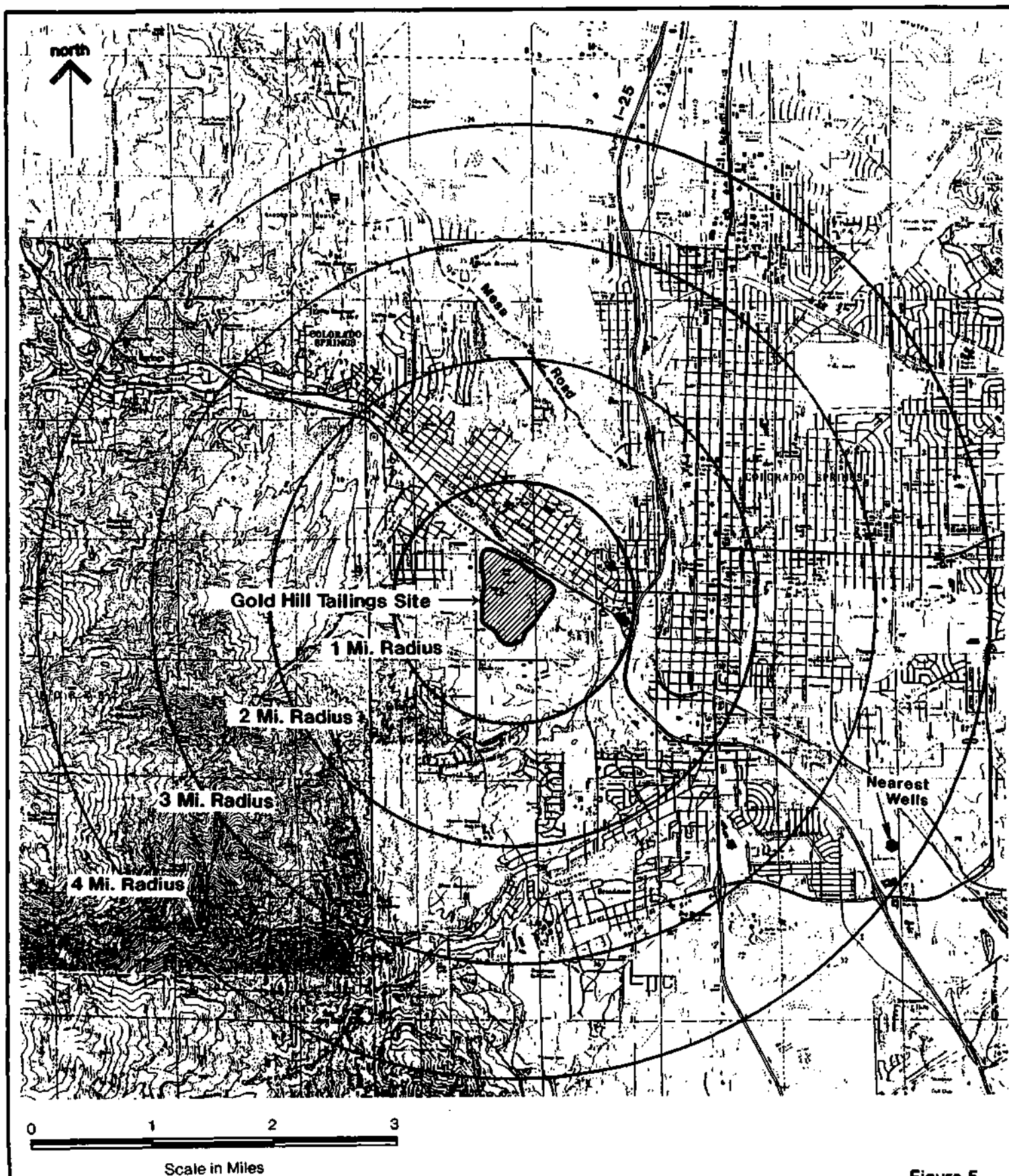


Figure 5

4-Mile Radius Map
Gold Hill Tailings
Colorado Springs, Colorado

Source: USGS 7.5' Quad Map of Colorado Springs, Cascade, Pikeview & Manitou Springs, Colorado

TABLE 1**Land Owners and Dates of Recorded Ownership for Gold Hill Tailings Site**

<u>OWNER</u>	<u>DATES</u>
Fountain Creek Corporation, Seattle	1977, 1980, 1983, 1993
APM Land, Inc.	1989
Langford Development, Inc.	1982
Pacific Building Corporation	1978 - 1980
Piranha Properties	1978 - 1979
Bank of Fountain Valley (*)	1978
Riverview Developments (*)	1978
Richard H. Hadley	1977 - 1978
California Pacific Investments, Inc. (*)	1977
1st National Bankette Corporation (*)	1977
William Wiley	1972 - 1974, 1976 - 1977
Gold Toe Associates	1973
Golden Cycle Corporation	1973
Gold Hill Mesa Corporation	1972 - 1973
W.P. and Clara E. O'Brien (*)	1972
Timothy J. Dennehy, Jr. (*)	1972
Front Range Construction Corp. (*)	1970
Lewson Development Corporation (*)	1968
Gold Hills Land Company (*)	1965
Pikes Peak National Bank (*)	?

(*) Owned only one parcel that includes portions of the tailings pile.

(Source: El Paso County Assessor's Office Records)

TABLE 2
Inorganic Results for Background and Millsite Area Soil Samples

(Results in mg/kg)

Sample ID CLP No.	GH-SO-1 MHBM66	GH-SO-2 MHBM66	GH-SO-3 MHBM67	GH-SO-4 MHBM68	GH-SO-6 MHBM72	GH-SO-9 MHBM73
Location	Background		Millsite			Dry Basin
Aluminum	9,950	8,360	36,100	6,730	4,380	16,900
Antimony	2.8 J ^{<} (5.04)	3.2 UJ	3.2 UJ	10.0 J ^{<}	13.1 J (13.1)	3.3 UJ
Arsenic	12.2	6.8	21.5	385	181	33.0
Barium	102 J (337)	97.7 J (322)	521 J (521)	241 J (241)	267 J (267)	232 J (232)
Beryllium	1.2	0.93 J ^{<}	4.5	1.2 J ^{<}	0.59 J ^{<}	1.9
Cadmium	1.4	0.75 J ^{<}	1.3	6.2	4.0	1.3
Calcium	6,840	5,450	142,000	137,000	8,320	15,900
Chromium	24.7	10.4	14.8	12.9	11.4	19.9
Cobalt	3.7 J ^{<}	3.7 J ^{<}	8.7 J ^{<}	3.0 J ^{<}	3.5 J ^{<}	12.6 J ^{<}
Copper	12.4 J (13.6)	12.1 J (13.3)	41.2 J (41.2)	86.1 J (86.1)	107 J (107)	39.1 J (39.1)
Iron	16,200	12,400	45,400	17,100	50,700	30,100
Lead	175	42.3	20.5	1,610	1,630	107
Magnesium	2,480	2,520	15,900	8,740	699 J ^{<}	6,940
Manganese	273	331	953	776	600	1,190
Mercury	0.11 U	0.12 U	0.22	4.7	2.2	0.38
Nickel	10.7	9.3 J ^{<}	20.2	9.6 J ^{<}	6.6 J ^{<}	28.8
Potassium	2,230	2,390	2,700	1,790	2,570	4,110
Selenium	15.2	15.2	1.4	9.0	15.9	25.4
Silver	1.2 J ^{<}	0.98 J ^{<}	1.8 J ^{<}	3.5	10.2	2.3 J ^{<}
Sodium	138 J ^{<} (1380)	126 J ^{<} (1260)	1,920 J (1920)	476 J ^{<} (476)	907 J ^{<} (907)	300 J ^{<} (300)
Thallium	2.0 UJ	2.6 UJ	4.6 UJ	2.6 UJ	4.6 UJ	4.1 UJ
Vanadium	26.1 J (31.3)	19.9 J (23.9)	50.1 J (50.1)	164 J (164)	47.9 J (47.9)	48.8 J (48.8)
Zinc	108 J (140)	87.5 J (114)	38.5 J (38.5)	3,720 J (3,720)	703 J (703)	186 J (186)
Cyanide	0.54 U	0.61 U	1.5	393	8.0	0.64 U

J = The associated numerical value is an estimated quantity because the Quality Control Criteria were not met.

U = Analyte was not detected. The number shown is the detection limit.

■ = Concentration is greater than or equal to three times the background level or concentration is greater than or equal to the Contract Required Detection Limit (CDRL) the analyte and was not detected in the background sample.

J[<] = Concentration is less than the CRDL.

() = Adjusted value based on potential bias, per EPA, 1994.

TABLE 3
Inorganic Results for Northeast Face of Tailings Pile and A-1 Mobile Village Soil Samples

(Results in mg/kg)

Sample ID CLP No	GH-SO-1 MHBM65	GH-SO-2 MHBM66	GH-SO-5 MHBM69	GH-SO-6 MHBM70	GH-SO-7 MHBM71	GH-SO-10 MHBM92	GH-SO-11 MHBM93	GH-SO-12 MHBM94
Location	Background		Northeast Face		F. Creek Wall	A-1 Mobile Village		
Aluminum	9,950	8,360	7,340	2240	9,620	1,820	2,670	3,460
Antimony	2.8 J ^c (5.04)	3.2 UJ	3.3 J ^c	12.6 J ^c	6.0 J ^c	6.0 J ^c	9.5 J ^c	7.0 J ^c
Arsenic	12.2	6.8	157	95.8	290	73.8	102	103
Barium	102 J (337)	97.7 J (322)	203 J (203)	194 J (194)	355 J (355)	159 J (159)	167 J (167)	145 J (145)
Beryllium	1.2	0.93 J ^c	1.5	0.45 J ^c	2.0	0.24 J ^c	0.3 J ^c	0.39 J ^c
Cadmium	1.4	0.75 J ^c	3.4	1.9	1.3	0.97 J ^c	1.9	1.6
Calcium	6,840	5,450	11,200	8,270	10,300	729 J ^c	1,890	1,810
Chromium	24.7	10.4	15.4	3.1 UJ	21.2	4.0 UJ	5.6	6.0
Cobalt	3.7 J ^c	3.7 J ^c	5.7 J ^c	1.6 J ^c	7.0 J ^c	2.5 J ^c	2.5 J ^c	2.4 J ^c
Copper	12.4 J (13.6)	12.1 J (13.3)	58.0 J (58.0)	69.0 J (69.0)	22.8 J (22.8)	38.9 J (38.9)	66.6 J (66.6)	81.5 J (81.5)
Iron	16,200	12,400	17,700	45,300	20,000	29,000	35,000	40,600
Lead	175	42.3	98.3	1,240	58.0	628	779	684
Magnesium	2,480	2,520	3,700	569 J ^c	5,300	422 J ^c	859 J ^c	817 J ^c
Manganese	273	331	1,200	291	1,310	159	250	229
Mercury	0.11 U	0.12 U	0.11 U	0.34	0.11 U	0.1 U	0.19	0.17
Nickel	10.7	9.3 J ^c	14.4	2.9 J ^c	14.9	4.4 J ^c	7.1 J ^c	4.9 J ^c
Potassium	2,230	2,390	3,590	4,320	4,600	2,000	2,940	2,290
Selenium	15.2	15.2	19.8	15.2	18.2	1.6	4.2	3.4
Silver	1.2 J ^c	0.98 J ^c	3.9	9.3	2.9	4.3	5.8	5.2
Sodium	138 J ^c (1,380)	126 J ^c (1,260)	339 J ^c	452 J ^c	530 J ^c	238 J ^c	265 J	246 J ^c
Thallium	2.0 UJ	2.6 UJ	4.5 UJ	3.7 UJ	4.5 UJ	2.1 UJ	3.6 UJ	3.0 UJ
Vanadium	26.1 J (31.3)	19.9 J (23.9)	93.4 J (93.4)	47.4 J (47.4)	165 J (165)	36.6 J (36.6)	39.9 J (39.9)	41.5 J (41.5)
Zinc	108 J (140)	87.5 J (114)	639 J (492)	348 J (268)	260 J (200)	186 J (143)	280 J (215)	338 J (260)
Cyanide	0.54 U	0.61 U	25.4 J (25.4)	3.7	1.4	1.0	1.6	1.7

J = The associated numerical value is an estimated quantity because the Quality Control Criteria were not met.

U = Analyte was not detected. The number shown is the detection limit.

■ = Concentration is greater than or equal to three times the background level or concentration is greater than or equal to the Contract Required Detection Limit (CDRL) and the analyte was not detected in the background sample.

J^c = Concentration is less than the CRDL.

() = Adjusted value based on potential bias, per EPA, 1994.

TABLE 4**Residents Within 200 feet of Sample Locations
In A-1 Mobile Village**

Trailer Unit Number	Number of Residents
6B	2
7B	2
8B	2
9B	2
10B	3
11B	4
12B	2
26A	4
27A	6
28A	5
29A	4
29A1	3
29A2	3
29A3	2
29A4	4
29A5	2
30A	5
31A	2
32A	2
33A	2
34A	1
35A	4
36A	2
37A	2

TOTALS: 24 Units**69 Residents***(Source: Smith, 1994)*

TABLE 5
Inorganic Results for Fountain Creek Sediment Samples
(Results in mg/kg)

Sample ID CLP No.	GH-SE-1 MHBM74	GH-SE-2 MHBM75	GH-SE-3 MHBM76	GH-SE-4 MHBM77	GH-SE-8 MHBM91	GH-SE-5 MHBM78	GH-SE-6 MHBM79	GH-SE-7 MHBM80
Location	Upstream	Adjacent to Tailings Pile			Alt. Source	Downstream	Below Confluence	Monument Creek
Aluminum	675	11,500	8,770	1,520	1,870	1,040	686	528
Antimony	2.8 UJ	3.5 UJ	3.3 UJ	3.0 UJ	3.0 UJ	3.1 UJ	3.1 UJ	3.0 UJ
Arsenic	1.3 J ^c	99.4	150	4.6	38.4	1.6 J ^c	2.9	0.78 J ^c
Barium	9.3 J ^c (30.7)	332 J (332)	442 J (442)	30.5 J ^c	86.4 J (86.4)	27.8 J ^c	17.8 J ^c	11.2 J ^c
Beryllium	0.28 J ^c	1.4 J ^c	1.9	0.48 J ^c	0.42 J ^c	0.39 J ^c	0.39 J ^c	0.23 U
Cadmium	0.64 U	1.5	1.4	0.7 U	0.99 J ^c	0.72 U	0.71 U	0.68 U
Calcium	45,900	13,600	13,200	16,100	3,270	7,280	3,950	969 J ^c
Chromium	1.9 UJ	14.7	14.8	3.0 UJ	4.3 UJ	1.4 UJ	1.7 UJ	1.3 UJ
Cobalt	1.1 U	7.1 J ^c	6.1 J ^c	1.2 U	1.2 U	1.2 U	1.2 U	1.1 U
Copper	2.8 J ^c (3.1)	19.7 J (19.7)	27.1 J (27.1)	2.5 J ^c	22.4 J (22.4)	1.5 J ^c	2.8 J ^c	1.2 J ^c
Iron	2,560	21,700	21,500	5,380	12,500	3,610	7,870	2,040
Lead	2.3	60.1	100	11.1	137	4.3	4.8	2.4
Magnesium	1,760	4,640	4,310	2,140	1,020 J ^c	1,510	1,460	184 J ^c
Manganese	76.4	681	1,130	183	201	122	193	87.0
Mercury	0.11 U	0.14 U	0.19	0.12 U	0.12 U	0.12 U	0.12 U	0.11 U
Nickel	2.3 U	16.3	11.9	2.6 J ^c	3.0 J ^c	2.6 U	3.0 J ^c	2.5 U
Potassium	234 J ^c	2,560	3,270	519 J ^c	813 J ^c	450 J ^c	203 J ^c	80.7 U
Selenium	23.4	25.2	23.4	24.3	9.9	17.2	11.6	4.3
Silver	0.43 U	1.4 J ^c	2.7	0.61 J ^c	1.8 J ^c	0.48 U	0.64 J ^c	0.46 U
Sodium	120 J ^c (1,200)	252 J ^c	313 J ^c	146 J ^c	178 J ^c	124 J ^c	114 J ^c	117 J ^c
Thallium	1.2 UJ	4.4 UJ	4.2 UJ	1.4 UJ	2.1 UJ	1.2 UJ	1.4 UJ	1.2 UJ
Vanadium	1.1 J ^c (1.3)	45.3 J (45.3)	70.9 J (70.9)	4.3 J ^c	18.6 J (18.6)	2.3 J ^c	4.8 J ^c	2.7 J ^c
Zinc	12.7 J (16.5)	184 J (184)	293 J (293)	23.8 J (23.8)	136 J (136)	17.4 J (17.4)	19.6 J (19.6)	6.9 J (6.9)
Cyanide	0.53 U	0.68 U	3.5	0.58 U	0.66	0.60 U	0.60 U	0.57 U

J = The associated numerical value is an estimated quantity because the Quality Control Criteria were not met.

U = Analyte was not detected. The number shown is the detection limit.

■ = Concentration is greater than or equal to three times the background level or concentration is greater than or equal to the Contract Required Detection Limit (CRDL) and the analyte was not detected in the background sample.

J^c = Concentration is less than the CRDL.

() = Adjusted value based on potential bias, per EPA, 1994.

TABLE 6
Inorganic Results for Fountain Creek Surface Water Samples
(Results in $\mu\text{g/l}$)

Sample ID CLP No.	GH-SW-1 MHBM81	GH-SW-2 MHBM82	GH-SW-3 MHBM83	GH-SW-8 MHBM88	GH-SW-4 MHBM84	GH-SW-10 MHBM90	GH-SW-5 MHBM85	GH-SW-6 MHBM86	GH-SW-7 MHBM87	GH-SW-9 MHBM89
Location	Background	NW Corner	North Central Drainage	DUP of SW-3	By N.E. Face	Alternate Source	Above Monument Creek	Below Monument Creek	Monument Creek	Rinse Blank
Aluminum	1,930	2,230	2,080	3,530	2,120	2,310	2,030	2,190	2,310	41.6 UJ
Antimony	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ	13.0 UJ
Arsenic	3.0 UJ	3.0 UJ	3.0 UJ	10.9 J (9.1)	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ	3.0 UJ
Barium	64.8 J ^c	71.9 J ^c	79.7 J ^c	138 J ^c	74.3 J ^c	79.1 J ^c	74.1 J ^c	72.0 J ^c	62.1 J ^c	1.0 U
Beryllium	1.2 J ^c	1.6 J ^c	1.6 J ^c	1.8 J ^c	1.1 J ^c	1.6 J ^c	1.1 J ^c	1.4 J ^c	1.0 U	1.0 U
Cadmium	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
Calcium	20,100	23,100	23,100	25,300	24,200	25,600	24,500	26,200	38,800	66.1 UJ ^c
Chromium	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Cobalt	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Copper	6.4 J ^c	6.3 J ^c	6.6 J ^c	10.1 J ^c	6.0 J ^c	6.2 J ^c	6.6 J ^c	6.1 J ^c	8.2 J ^c	5.0 U
Iron	3,080 J (3,696)	3,540 J (3,540)	3,370 J (3,370)	5,820 (5,820)	3,370 J (3,370)	3,870 J (3,870)	3,300 J (3,300)	3,610 J (3,610)	4,250 J (4,250)	79.4 J (79.4)
Lead	8.7	9.6	9.8	25.8	9.8	15.3	10.3	10.0	6.7	2.0 U
Magnesium	4,000 J ^c	5,380	4,770 J ^c	5,690	5,480	6,030	5,480	5,670	7,160	16.0 U
Manganese	204	215	250	402	228	245	226	219	153	2.0 U
Mercury	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U	11.0 U
Potassium	2,320 J ^c	2,710 J ^c	2,910 J ^c	3,300 J ^c	2,770 J ^c	2,810 J ^c	2,690 J ^c	2,660 J ^c	3,420 J ^c	354 U
Selenium	54.7	60.0	59.1	64.9	59.7	67.4	66.0	70.7	86.5	3.0 U
Silver	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Sodium	9,430	14,400	11,100	11,100	12,900	13,500	13,000	13,200	17,700	80.1 UJ
Thallium	4.6 UJ	4.2 UJ	2.0 U	7.2 UJ	2.8 UJ	2.0 U	2.0 U	4.6 UJ	5.9 UJ	2.4 UJ
Vanadium	4.0 U	4.0 U	4.0 U	7.3 J ^c	4.0 U	4.0 U	4.0 U	6.0 J ^c	5.0 J ^c	4.0 U
Zinc	28.0	35.1	35.3	71.2	34.4	40.6	35.9	37.4	28.9	9.3 J ^c
Cyanide	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U

U = The element was not detected. The number shown is the detection limit.
J^c = The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
= Concentration is less than the Contract Required Detection Limit (CDRL).
= Concentration is greater than the CDRL and was not detected in the background sample.
() = Adjusted value based on potential bias, per EPA, 1994.

TABLE 7**Summary of Wetland Frontages Along Fountain Creek
Within 15 Downstream Miles of Gold Hill Tailings**

Type of Wetland*	Frontage Length (in miles)	Stream Distance from Site (in miles)
Scrub-Shrub (c)	0.2	0.76
Palustrine, Forested (a)	0.19	1.43
Palustrine, Forested (a)	0.76	3.52
Palustrine, Forested (a)	0.16	4.19
Palustrine, Forested (a)	0.47	4.52
Plains, Streamside (b)	0.78	4.95
Plains, Streamside (b)	0.93	6.92
Palustrine, Forested (a)	0.31	7.74
Palustrine, Forested (a)	0.48	9.60
Palustrine, Forested (a)	0.76	10.02
Palustrine, Forested (a)	0.10	11.64

* = Meets definition of wetland at 40 CFR 230.3.

(a) = As indicated by NWI map (USF&WS).

(b) = Mapped as a "plains, streamside environment" that is inhabited by emergent hydrophytes, such as rushes, sedges and cattails (USGS, 1979b).

(c) = Opinion of Van Truan, Biologist, U.S. Army Corps of Engineers, Southern Colorado Regulatory Office (MK, 1994).

APPENDIX A
SAMPLING ACTIVITIES REPORT



MORRISON KNUDSEN CORPORATION

ENVIRONMENTAL SERVICES DIVISION
7100 E. BELLEVUE AVENUE, SUITE 300
ENGLEWOOD, COLORADO U.S.A. 80111
PHONE: (303) 793-5000/FAX: (303) 290-0238

June 13, 1994

Ms. Pat Smith
Site Assessment Manager
USEPA, 8HWM-SM
999 18th Street, Suite 500
Denver, CO 80202-2405

Reference: ARCS Contract No. 68-W9-0025
WA 28-8JZZ

Subject: Gold Hill Tailings Site
SAR, CERCLIS ID# COD983801275

Dear Pat:

The Sampling Activities Report for the Gold Hill Tailings Site is enclosed. MK has concerns about exposure of residents to tailings material that has migrated from the site onto the adjacent A-1 Mobile Village. Based on MK field measurements there are 69 residents living in 24 trailers that are within 200 feet of samples collected in the trailer park.

Numerous structural hazards are present in the millsite area. These include subsurface tunnels, potentially unstable walls and ceilings, and trench and manhole openings above flooded basements. There are also numerous signs of recreational use of the millsite, such as graffiti. Youths were also seen jumping across gaps in elevated concrete platforms. Injury could also result from youths playing on numerous narrow pillars and posts at the millsite. The millsite is partially fenced on the west and south sides, but there are no other barriers to prevent access.

Sincerely,

Mark Lunsford
Environmental Specialist

APPROVED:

Marta Green
Pre-Remedial Manager

Enclosure

cc: R.E. Heise w/enclosures
M. Caban (8PM-GSC) letter only
G. Hargreaves (9HWM-SM) letter only

SAMPLING ACTIVITIES REPORT

GOLD HILL TAILINGS SITE

INTRODUCTION

This Sampling Activities Report (SAR) is prepared in partial fulfillment of Work Assignment Number 28-8JZZ issued to Morrison Knudsen Corporation, Environmental Services Division (MK) by the Region VIII office of the U.S. Environmental Protection Agency (EPA) under ARCS Contract Number 68-W9-0025. The subject of this SAR is the Gold Hill Tailings site in Colorado Springs, Colorado (EPA ID# COD983801275). A Sampling and Analysis Plan (SAP) was prepared and approved by EPA on April 22, 1994. The SAP served as a guide for fieldwork associated with the Site Inspection. The SAR discusses compliance with and deviations from the SAP and other field observations.

BACKGROUND

The Gold Hill Tailings Site is located in Colorado Springs, Colorado. The tailings pile is 170 acres in size and is associated with the Golden Cycle Mill, which operated from 1903 to 1949. It covers most of the east half of Section 14 and portions of the western edge of Section 13, T. 14 S., R. 67 W. The site is bounded by Fountain Creek and Highway 24 (Midland Expressway) on the north, 21st Street on the west, Rio Grand Street and Moreno Avenue on the south, and residential areas on the east including the A-1 Mobile Village (see Figure 1).

FIELD OPERATIONS

Stream Sampling

Surface water and sediment samples were collected from seven locations in Fountain Creek and one location in Monument Creek on May 17, 1994. These sampling locations are shown in Figure 1. Fountain Creek had a rust-brown color due to a high flow rate from spring snow melt runoff. Surface water sample GH-SW-1 and sediment sample GH-SE-1 were collected upstream from the site west of the 21st Street bridge along a portion of Fountain Creek adjacent to the G. & C. Packing Company at 240 South 21st Street (see photo #1). Fine sediment could not be located in the immediate vicinity of the upstream location due to the lack of pools and high stream velocity. Coarse substrate

was collected from the center of the channel. Surface water field measurement data is presented in Table 1.

Samples GH-SW-2 and GH-SE-2 were collected at the base of a large exposed soil face along the south bank of Fountain Creek in the northwest corner of the site. The soil face is located along a stream meander downstream of the Highway 24 bridge over Fountain Creek. A layer of reddish-brown fine sand was visible in the center of the exposed soil face (see photo #2). This material was characterized as "roaster" tailings in an Environmental Liability Assessment prepared on the site in 1988 by ENSR Consulting & Engineering. During a reconnaissance along Fountain Creek on May 11, 1994, the roaster tailings were being eroded by high streamflow into the Creek (see photo #3). On May 17 it was apparent the additional material from the streambank had fallen onto the lower bank covering the small area where the tailings were in contact with the creek (see photo #4). Samples were not collected from this portion of the streambed due to safety hazards presented by the unstable slope.

Sample GH-SE-3 was collected at the mouth of a drainage from the north central part of the tailings pile. The drainage mouth drops about 2 feet directly into Fountain Creek (see photo #5). Sample GH-SW-3 was collected directly beneath the mouth. Most of the area in this drainage has uncovered tailings present at the surface (see photos #6 through 8).

Samples GH-SE-4 and GH-SW-4 were collected just downstream of where the drainage channel from the northeast face of the tailings pile enters the creek. A sample was not collected directly at the probable point of entry (PPE) of tailings material to the creek because the south bank where the drainage channel enters has been covered with asphalt and the sediment in the center of the creek was composed of coarse material (see photos #9 and 10). The SAP specified that these samples would be collected downstream of an alternate source of contamination along Fountain Creek. Samples GH-SE-8 and GH-SW-10 are associated with the alternate source.

Sample GH-SE-5 was collected near the west bank at the mouth of Fountain Creek adjacent to the confluence with Monument Creek (see photo #11). Sample GH-SW-5 was collected near the east bank at the mouth of Fountain Creek in a pool adjacent to a sand spit separating the creeks where the flow was less turbulent. This location represents the beginning of the nearest downstream wetland segment from the site. Samples GH-SE-6 and GH-SW-6 were collected downstream of the confluence beyond

0.1 mile of wetland frontage (see photo #12). This sample point is located downstream of the mixing zone below the confluence. This mixing zone was obvious because of color differences in the creeks. Above the confluence Fountain Creek was a turbid, rust-brown color. Monument Creek was a turbid greenish-gray color (see photo #11). The mixing zone extended downstream from the Cimarron Street bridge.

Samples GH-SW-7 and GH-SE-7 were collected in Monument Creek just upstream of a concrete retaining wall located upstream of the confluence with Fountain Creek (see photo #13). GH-SW-10 and GH-SE-8 were collected immediately downstream of an alternate potential source of contamination along the north bank of Fountain Creek between the Interstate 25 and Highway 24 bridges. A small channel (1 foot wide) in this area conveys drainage from a culvert that may originate at an adjacent auto parts/salvage yard (see photo #14). The channel appeared to contain oily sediment and splits into two channels both of which empty into the creek. The first branch leads on southeastward into the creek. The second branch continues roughly 35 feet to the east, then roughly 75 feet southeastward and enters the creek downstream from the first branch. GH-SW-10 and GH-SE-8 were collected just downstream of the second branch (see photo #15).

Soil Sampling

A total of twelve soil samples were collected during May 17-19, 1994. The locations of soil samples GH-SO-1 and GH-SO-2 are shown in Figure 1. Soil samples GH-SO-3 through GH-SO-9 were collected onsite at the locations shown in Figure 2. Soil samples GH-SO-10 through GH-SO-12 were collected in the northwest portion of A-1 Mobile Village at the locations shown in Figure 3.

Background sample GH-SO-1 was collected within the City of Colorado Springs Utilities Department "Little Mesa" Tank property at 1410 Manitou Boulevard. The sample location is approximately 30 feet north of the north portion of the fence around the radio tower (see photo #16). The soil at this location consisted of brown silt and sand loam. The soils in this area have been mapped as Chaseville-Midway Complex soil.

Background sample GH-SO-2 was collected west of Beidelman Environmental Center (BEC) within Sonderman Park at 740 Camarillo Street. The sample location is west of the intersection of the main park trail and the trail leading west from the BEC (see photo #17). The soil at this location consisted of brown sandy loam. Soils in this area have been classified as Razor-Midway Complex soil.

Sample GH-SO-3 was collected from the northwest portion of the former sand leach tank area of mill site (see photo #18). Six inches of soil and tailings rest on concrete and/or masonry surfaces in this area. Slag cinders are scattered on the surface. Beneath the surface is a brown silty sand. Sample GH-SO-4 was collected from a small pile near the east wall of the basement in the filter portion of the slime room at the millsite (see photo #19). The material in the pile consisted of brown silt and sand with small white and gray quartz fragments. The quartz fragments may have come from rough masonry surfaces that were present nearby.

Sample GH-SO-5 was collected in a gully at the base of the northeast face of the tailings pile (see photo #20). This sample consisted of fine reddish-brown "roaster" tailings. Sample GH-SO-6 was collected from the lower slope of the northeast face of the tailings pile (see photo #21). This sample consisted of yellow-green to tan fine sand. This material was identified by ENSR as "flotation" tailings.

The SAP specified that GH-SO-7 through GH-SO-9 would be collected from the Northern Commons Area of the Villa de Mesa (VDM) Condominiums. The VDM Homeowner's Association, however, denied MK access to collect samples on their property. Sample GH-SO-7 was collected from the exposed soil face along the south bank of Fountain Creek in the northwest corner of the site above the edge of the creek where GH-SW-2 and GH-SE-2 were collected (see photo #2). This sample was collected from a layer of fine reddish brown sand ("roaster" tailings). The portion of the streambed that was sampled appeared to be stable and the tailings were not visibly eroding into the creek as was apparent at an adjacent portion of the streambed on May 11, 1994.

Sample GH-SO-8 was collected from the center of the basement in the slime area of the mill site (see photo #22). This sample consisted of light brown to tan fine sand with some silt and slag, cinder and/or coal fragments. Sample GH-SO-9 was collected at the lowest part of a dry basin north of the mill site (see photo #23). Soil in the basin consisted of dark brown silty loam. During the operation of the Golden Cycle Mill this basin may have been used as a cooling pond and may have received runoff from the mill site area. Currently there is no overland flow path or other visible drainage from the basin to Fountain Creek.

The samples collected in A-1 Mobile Village all consisted of tan to light brown fine sand that has the same color and texture as the flotation tailings sample GH-SO-5 collected

from the northeast face of the tailings pile. Sample GH-SO-10 was collected approximately 5 feet northwest of the northwest corner of trailer unit 29A5 (see photo #24). Sample GH-SO-11 was collected approximately 10 feet north of the northeast corner of trailer unit 31A (see photo #25). Sample GH-SO-12 was collected east of the background fence located between trailer units 33A and 34A (see photo #26).

Quality Control Samples

Sample GH-SO-4 was designated as a matrix spike (MS)/MS Duplicate (MSD). Sample GH-SW-4 was not designated as an MS/MSD sample on the Chain of Custody Record, but was so designated in verbal communication with the RSCC and the assigned CLP laboratory. A duplicate sample, GH-SW-8, was collected from sample location GH-SW-3, rather than GH-SW-2 as specified in the SAP. A rinsate blank, GH-SW-9 was collected as specified in the SAP.

Sample Documentation and Shipment

Protocols for NEIC chain-of-custody were strictly followed. Sampling documentation, including sample identification numbers, sample tag numbers, and CLP sample numbers are summarized in Table 2.

Samples were shipped to Southwest Labs of Oklahoma in Broken Arrow, Oklahoma under Case #22102 via Federal Express on May 18 and 19, 1994 under airbill numbers 8390016854 and 1499985874, respectively. All samples are to be analyzed under routine analytical services (RAS) protocols at low or environmental concentrations for TAL total metals and cyanide.

MK provided sample containers and collected split samples for the site owner, Fountain Creek Corporation (FCC). FCC did not witness the sampling. Split samples were provided for all samples except GH-SW-8 and GH-SW-9. MK delivered the split samples to the law offices of Kenneth Covell at 102 N. Cascade Avenue, Colorado Springs, and relinquished the samples to Shawn McGee, a representative of the Pace, Inc. laboratory in Golden, Colorado. Pace will analyze the split samples for FCC.

NON-SAMPLING DATA COLLECTION

On May 18, MK interviewed the resident manager of A-1 Mobile Village, Marge Smith, to identify residents of trailers within 200 feet of the samples collected on that property. Data based on her responses is summarized in Table 3.

On May 11, MK met with Van Truan, a Biologist with the U.S. Army Corps of Engineers (USACE) Southern Colorado Regulatory Office in Pueblo, to conduct a wetlands reconnaissance for the basin northwest of the mill site and along Fountain Creek downstream from the Highway 24 bridge. The National Wetland Inventory (NWI) Map of the Colorado Springs quadrangle indicated the presence of palustrine, forested wetlands in the basin onsite and along Fountain Creek between Highway 24 and Interstate 25. Mature cottonwood trees present along the perimeter of the onsite basin are not indicative of wetlands according to Mr. Truan. The south bank of Fountain Creek and east of the Highway 24 bridge are occupied by 6- to 8-year old peach-leaf willows and young cottonwoods. He pointed out that these trees appeared to be stressed, but could be indicative of a wetland although hydrologic conditions along this stretch aren't favorable.

The shoreline fringes of Fountain Creek downstream of the confluence with Monument Creek to the city power plant bridge and upstream of the confluence to the abandoned railroad bridge across Monument Creek were observed for indicative wetland vegetation. Young sand bar willows occur along the shore throughout these stream reaches. Mr. Truan was involved in the granting of Section 404 permit needed to allow the construction of the bridge by the power plant (see photo #27). Upstream of the confluence a single row of willows are present on both sides of Monument Creek, upstream and downstream from the railroad bridge (see photo #28). He believes the lines of willows in this stream reach demarcates the border of the wetland fringe. He believes these wetland fringe areas along the creeks are a scrub/shrub type of wetland. These findings are consistent with the results of a 1990 wetlands survey of the portions of these creeks within the I-25 corridor that was performed for the Colorado Department of Transportation.

Large areas of the ground surface in the north central and northeast portions of the site were lacking cover material. Photos 6 through 8 show the portions of the drainage from the north central portion of the site that do not have cover material. Photos 24, 26 and 31 show views of the northeast face of the tailings pile from A-1 Mobile Village. Photos 29 and 30 show other views of the northeast face. A cylindrical steel tank approximately

15 feet long x 7 feet in diameter is present in the ore bin area of the mill site (see photos #34 and 35). No odors were noticeable near the tank. The tank is believed to be empty.

Children were observed playing on suspected tailings material near the A-1 Mobile Village/site boundary (see photo #31). Youths were also observed in the mill site area (see photo #32) in the vicinity of the former Tin Box and Precipitating Rooms and jumping across on elevated platforms at the roasting furnace (see photos #22 and 23 and Figure 2). A long trench and manholes in the Tin Box and Precipitating room floors were open to basement areas where water has accumulated. Leakage from the basements may have caused the saturated soil conditions that were noted in the mill site area. A motorcyclist and bicyclists also were observed onsite on May 11 (see photo #33).

William Cody, a resident of trailer unit 29A4 at A-1 Mobile Village, reported to MK that storm water runoff from the northeast face of the tailings pile deposited several inches or more of tailings onto the ground around his trailer during a single storm event. He also reported that an outdoor cooling basin for the air conditioner in his trailer accumulated 3 to 4 inches of tailings over the winter from airborne deposition of dust from the northeast face of the tailings pile.

It was also reported to MK that children swim in Fountain Creek below the confluence with Monument Creek. Transients were also observed along Fountain Creek beneath the Highway 24 bridge and at the confluence with Monument Creek on May 11.

TABLE 1**Field Measurement Data for Fountain Creek**

Sample ID	pH (a)	Conductivity (b)	Temperature
GH-SW-1	5.5	90 μ mhos	52° F.
GH-SW-2	5.5	150 μ mhos	63° F.
GH-SW-3	6	160 μ mhos	68° F.
GH-SW-4	6	180 μ mhos	66° F.
GH-SW-5	6	195 μ mhos	56° F.
GH-SW-6	6	200 μ mhos	61° F.
GH-SW-7 (*)	6	315 μ mhos	67° F.
GH-SW-10 (✓)	6	220 μ mhos	56° F.

(a) Colorimetric reading obtained using colorpHast pH 5-10 reagent paper.

(b) Obtained using Prestotek DP-03 Conductivity Meter calibrated to 700 μ mhos standard solution.

* Location in Monument Creek just upstream of confluence with Fountain Creek.

(✓) No measurements were taken for GH-SW-8 (duplicate of GH-SW-3) or GH-SW-9 (Rinsate Blank)

TABLE 2

SAMPLE DOCUMENTATION SUMMARY FOR GOLD HILL TAILINGS
Case #22102

Station No.	INORGANICS		Sample Date/Time	QC Sample
	CLP ID	Tag No.		
GH-SO-1	MHBM65	8-96651	5/17/94; 1415	
GH-SO-2	MHBM66	8-96652	5/17/94; 1025	
GH-SO-3	MHBM67	8-96653	5/19/94; 0835	
GH-SO-4	MHBM68	8-96654	5/19/94; 0915	MS/MSD
GH-SO-5	MHBM69	8-96655	5/18/94; 1615	
GH-SO-6	MHBM70	8-96656	5/18/94; 1620	
GH-SO-7	MHBM71	8-96657	5/17/94; 1255	
GH-SO-8	MHBM72	8-96658	5/19/94; 0925	
GH-SO-9	MHBM73	8-96659	5/19/94; 0950	
GH-SO-10	MHBM92	8-96689	5/18/94; 1500	
GH-SO-11	MHBM93	8-96690	5/18/94; 1505	
GH-SO-12	MHBM94	8-96691	5/18/94; 1515	

TABLE 2 (Continued)

SAMPLE DOCUMENTATION SUMMARY FOR GOLD HILL TAILINGS
Case #22102

Station No.	INORGANICS			Sample Date/Time	QC Sample
	CLP ID	Tag No.			
		Metals	CN		
GH-SW-1	MHBM81	8-96661	8-96662	5/17/94; 1100	
GH-SW-2	MHBM82	8-96663	8-96664	5/17/94; 1320	
GH-SW-3	MHBM83	8-96665	8-96666	5/17/94; 1520	
GH-SW-4	MHBM84	8-96667	8-96668	5/17/94; 1635	MS/MSD
GH-SW-5	MHBM85	8-96669	8-96670	5/17/94; 1745	
GH-SW-6	MHBM86	8-96671	8-96672	5/17/94; 1715	
GH-SW-7	MHBM87	8-96673	8-96674	5/17/94; 1800	
GH-SW-8	MHBM88	8-96676	8-96675	5/17/94; 1525	DUP of SW-3
GH-SW-9	MHBM89	8-96677	8-96678	5/18/94; 1140	Rinse Blank
GH-SW-10	MHBM90	8-96686	8-96687	5/17/94; 1840	

TABLE 2 (Continued)

SAMPLE DOCUMENTATION SUMMARY FOR GOLD HILL TAILINGS
Case #22102

Station No.	INORGANICS		Sample Date/Time	QC Sample
	CLP ID	Tag No.		
GH-SE-1	MHBM74	8-96679	5/17/94; 1110	
GH-SE-2	MHBM75	8-96680	5/17/94; 1305	
GH-SE-3	MHBM76	8-96681	5/17/94; 1530	
GH-SE-4	MHBM77	8-96682	5/17/94; 1640	
GH-SE-5	MHBM78	8-96683	5/17/94; 1750	
GH-SE-6	MHBM79	8-96684	5/17/94; 1720	
GH-SE-7	MHBM80	8-96685	5/17/94; 1805	
GH-SE-8	MHBM91	8-96688	5/17/94; 1845	

TABLE 3**Residents Within 200 feet of Sample Locations
in A-1 Mobile Village**

Trailer Unit Number	Number of Residents
6B	2
7B	2
8B	2
9B	2
10B	3
11B	4
12B	2
26A	4
27A	6
28A	5
29A	4
29A1	3
29A2	3
29A3	2
29A4	4
29A5	2
30A	5
31A	2
32A	2
33A	2
34A	1
35A	4
36A	2
37A	2

TOTALS: 24 Units**69 Residents***(Source: Smith, 1994)*

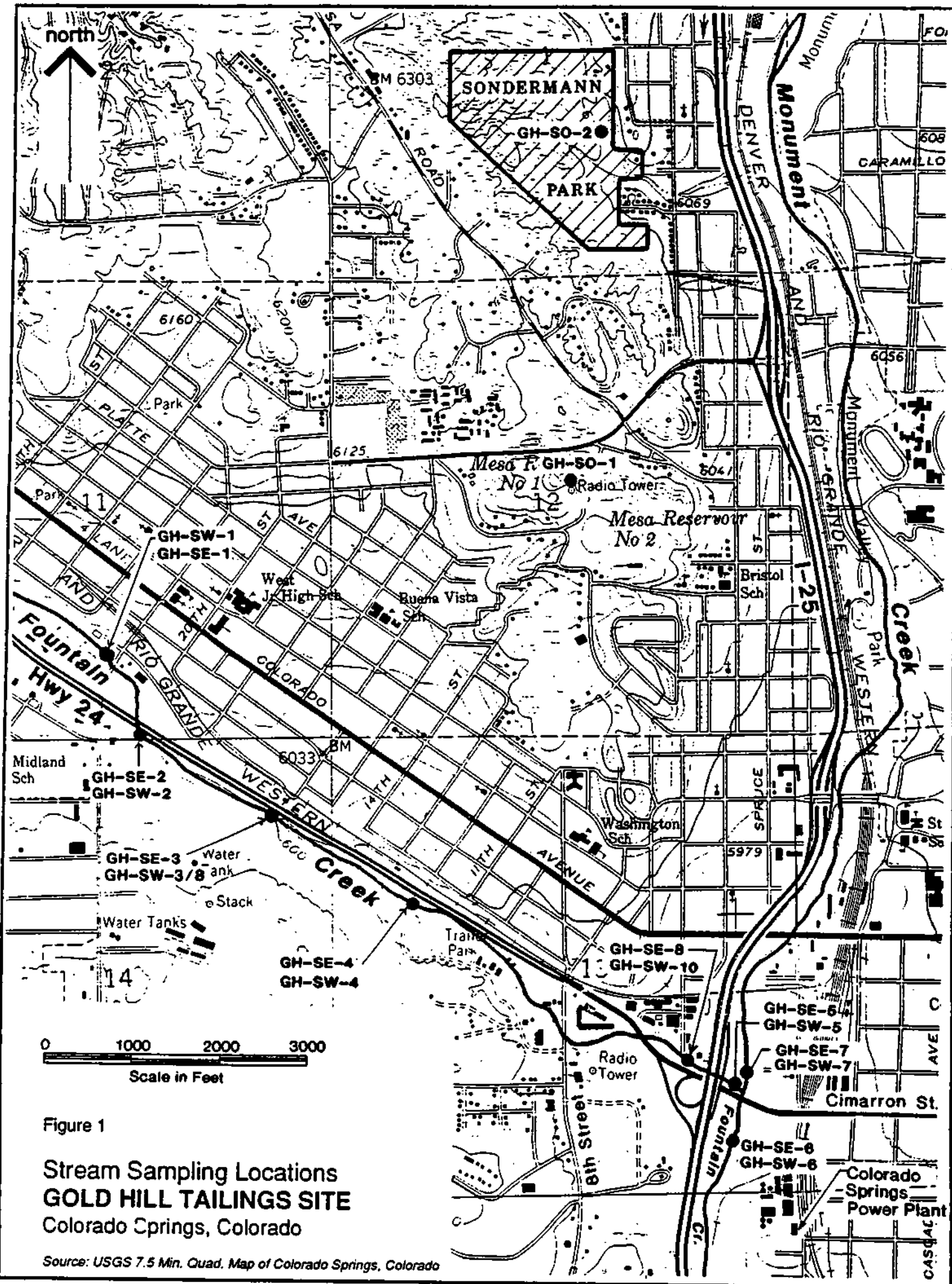
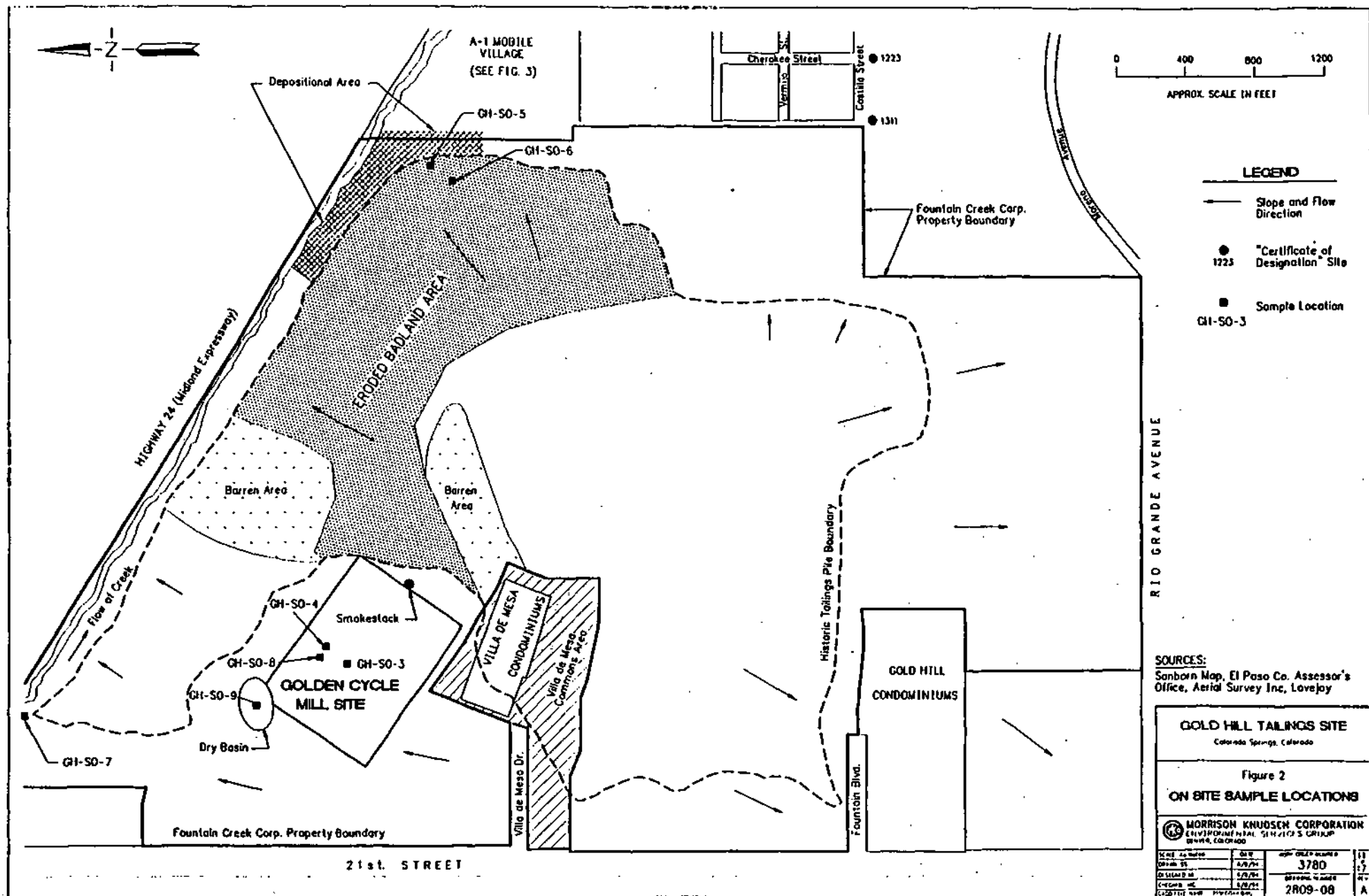


Figure 1

Stream Sampling Locations **GOLD HILL TAILINGS SITE** Colorado Springs, Colorado

Source: USGS 7.5 Min. Quad. Map of Colorado Springs, Colorado



SOURCES:
 Sanborn Map, El Paso Co. Assessor's Office, Aerial Survey Inc, Lovejoy

GOLD HILL TAILINGS SITE Colorado Springs, Colorado

Figure 2 **ON SITE SAMPLE LOCATIONS**

MORRISON KNUDSEN CORPORATION
 ENVIRONMENTAL SERVICES GROUP
 DENVER, COLORADO

SCALE: AS SHOWN	DATE: 5/2/74	PROJECT NUMBER: 3780	BY: JY
DRAWN BY: JY	5/2/74	REVISION NUMBER: 2809-08	DATE: 5/2/74
CHECKED BY: JY	5/2/74		
APPROVED BY: JY	5/2/74		

Figure 1

**OFFSITE SAMPLE LOCATIONS
IN NORTHWEST PART
A-1 MOBILE VILLAGE**

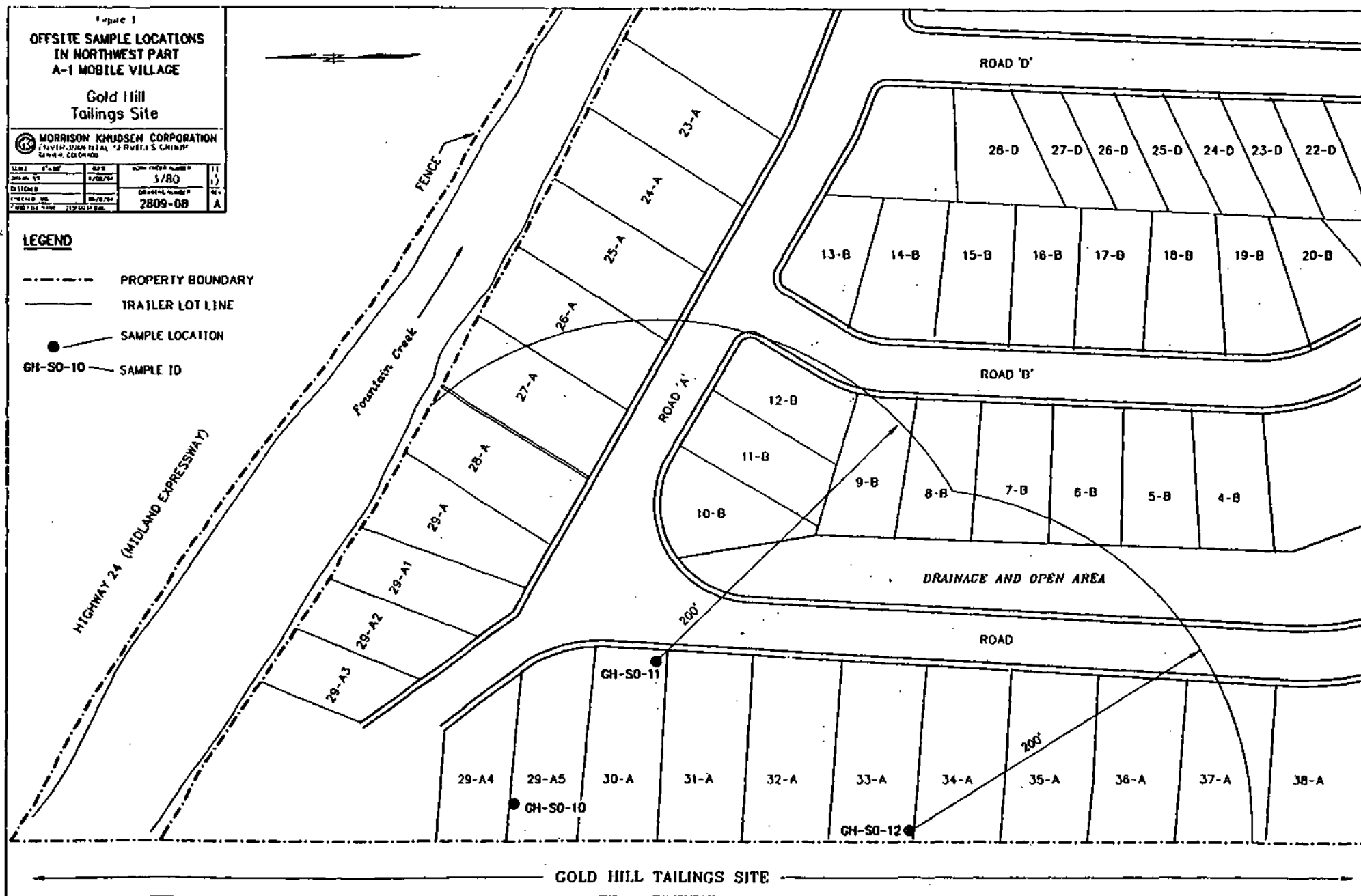
Gold Hill
Tailings Site

MORRISON KNUDSEN CORPORATION
(DIVISION OF THE "ARVESTA" GROUP)
DENVER, COLORADO

DATE	11/1/80	BY	3/80	TT
DESIGNED BY		DATE	3/80	12
CHECKED BY		DATE	3/80	12
PROJECT NO.	2809-08	DATE	3/80	12
PROJECT NAME	2809-08	DATE	3/80	12

LEGEND

- PROPERTY BOUNDARY
- TRAILER LOT LINE
- SAMPLE LOCATION
- GH-SO-10 SAMPLE ID



GOLD HILL TAILINGS SITE



Photo No.

1



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Mark Lunsford

Date 5/17/94

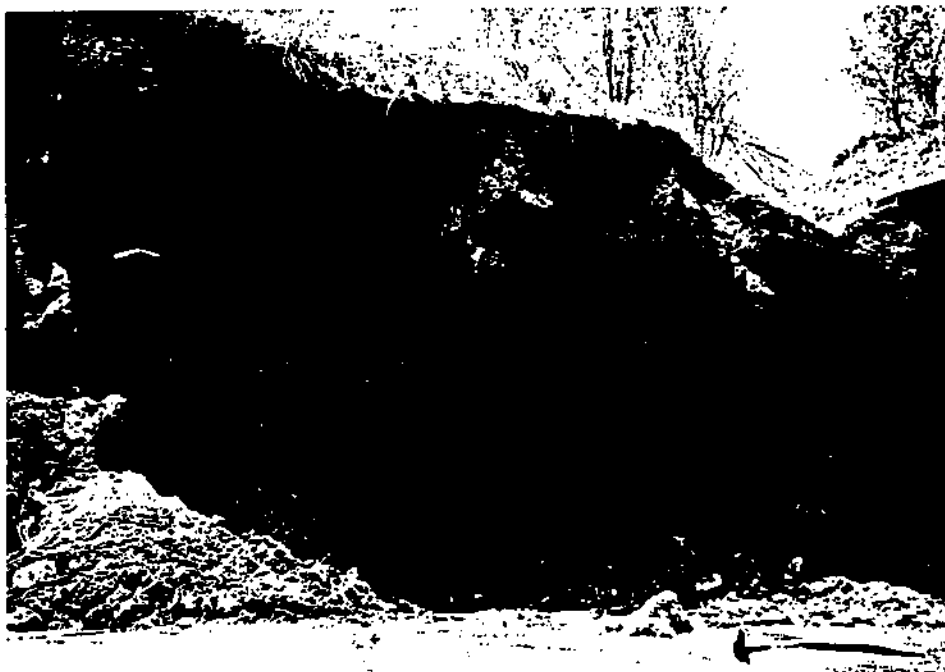
Time 1100

Direction Southeast

Description MK collecting upstream surface water sample GH-SW-1 from Fountain Creek. The 21st street bridge is downstream. Sediment sample GH-SE-1 was collected in center of stream at this location.

Photo No.

2



Photographer/Witness Wesley Hill

Date 5/17/94

Time 1325

Direction South

Description Exposed soil face along south border of Fountain Creek in northwest corner of site. Samples GH-SW-2 and GH-SE-2 were collected at base of the soil wall. The pink to reddish-brown layer at left center is suspected "roaster" tailings. Soil sample GH-SO-7 was collected from this layer.

Page 1

Of 18



Photo No.

3

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/11/94

Time _____

Direction South

Description Pink to reddish brown layer of suspected "roaster" tailings in exposed soil face
in northwest corner of site is eroding into Fountain Creek.

Photo No.

4



Photographer/Witness Mark Lunsford

Date 5/17/94

Time _____

Direction South

Description Unstable soil face along south
bank of Fountain Creek in northwest portion of
site. Collapse of material covered location
where the "roaster" tailings were in direct
contact with the creek.

Page 2

of 18



Photo No.

5

Site Name:

Gold Hill Tailings

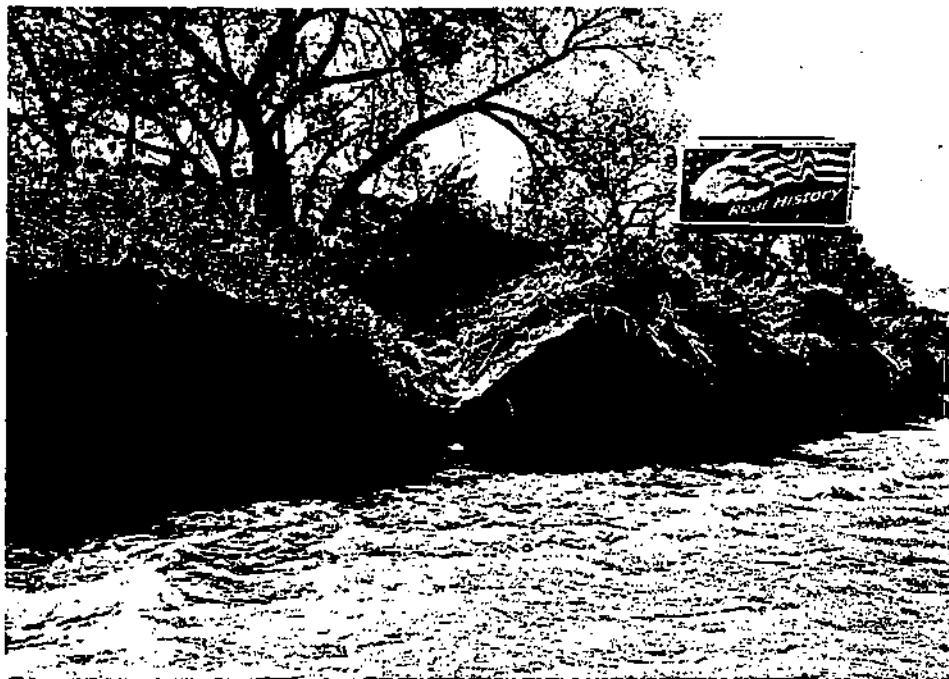
Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/17/94 Time 1535 Direction West

Description "Mouth" of drainage channel from north central part of tailings pile. Sample
GH-SE-3 was collected at edge of channel above Fountain Creek. Sample GH-SW-3 was
collected in the creek beneath the 2-foot drop from the channel.

Photo No.

6



Photographer/Witness Mark Lunsford

Date 5/17/94 Time _____ Direction Southeast

Description Lower part of drainage channel from north central part of tailings pile. Exposed
tailings are visible in center.

Page 3

Of 18



Photo No.

7

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/17/94

Time _____

Direction South

Description View of middle part of drainage channel from north central part of tailings pile
showing exposed tailings.

Photo No.

8



Photographer/Witness Mark Lunsford

Date 5/11/94

Time _____

Direction North

Description Upper part of drainage channel that extends from north-central portion of tailings
pile to Fountain Creek.

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Photo No.

9



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Mark Lunsford

Date 5/17/94

Time

Direction East

Description Tailings material in drainage channel from northeast face of pile enters
Fountain Creek at this location.

Photo No.

10



Photographer/Witness Mark Lunsford

Date 5/17/94 Time 1645 Direction East

Description Fountain Creek downstream of
entry point of tailings from drainage channel of
northeast face. Samples GH-SE-4 and GH-
SW-4 were collected behind clump of grass by
the right (south) bank. Asphalt covers the
south bank.



Photo No.

11

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/11/94

Time 1755

Direction Northeast

Description Confluence of Fountain Creek (on left) and Monument Creek (on right)

from beneath Cimarron Street bridge. Sample GH-SE-5 was collected from small pool of
water in Fountain Creek adjacent to sand spit separating the creeks. Sample GH-SW-5 was
collected near the west bank of Fountain Creek in lower portion of photo.

Photo No.

12



Photographer/Witness Mark Lunsford

Date 5/17/94

Time

Direction North

Description Looking upstream toward Cimarron Street bridge from sample location GH-SE-6.
Scrub-shrub wetlands are present in this segment of Fountain Creek.

Page 6

Of 18



Photo No.

13



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Mark Lunsford

Date 5/17/94

Time 1810

Direction SSW

Description View of Monument Creek looking downstream at confluence with Fountain Creek
and Cimarron Street bridge. Samples GH-SW-7 and GH-SE-7 were collected upstream of
the concrete retaining wall near the right (west) bank.

Photo No.

14



Photographer/Witness Mark Lunsford

Date 5/17/94 Time _____ Direction North

Description Culvert with oily outflow channel
that leads to Fountain Creek. Culvert is
located between the Interstate 25 and Highway
24 bridges.



Photo No.

15



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photo No.

16



Photographer/Witness Mark Lunsford

Date 5/17/94 Time 1850 Direction Southeast

Description Looking downstream along
Fountain Creek toward I-25 bridge from sample
location GH-SW-10/GH-SE-8.

Page 8

of 18

Photographer/Witness Mark Lunsford

Date 5/17/94 Time 1405 Direction SSE

Description View of background soil sample
(GH-SQ-1) location. The red building is at the
base of a radio tower. The City of Colorado
Spring's "Little Mesa" water storage tank is in
the background.



Photo No.

17



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Wesley Hill

Date 5/17/94 Time 1035 Direction West

Description Entry sign to the Colorado Springs city park where background soil sample
GH-SO-2 was collected.

Photo No.

18



Photographer/Witness Mark Lunsford

Date 5/19/94 Time 0840 Direction Southeast

Description View of sample location GH-SO-3
in sand leach tank area of millsite. The mill
stack is in the background.

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Photo No.

19

Site Name:

Gold Hill Tailings

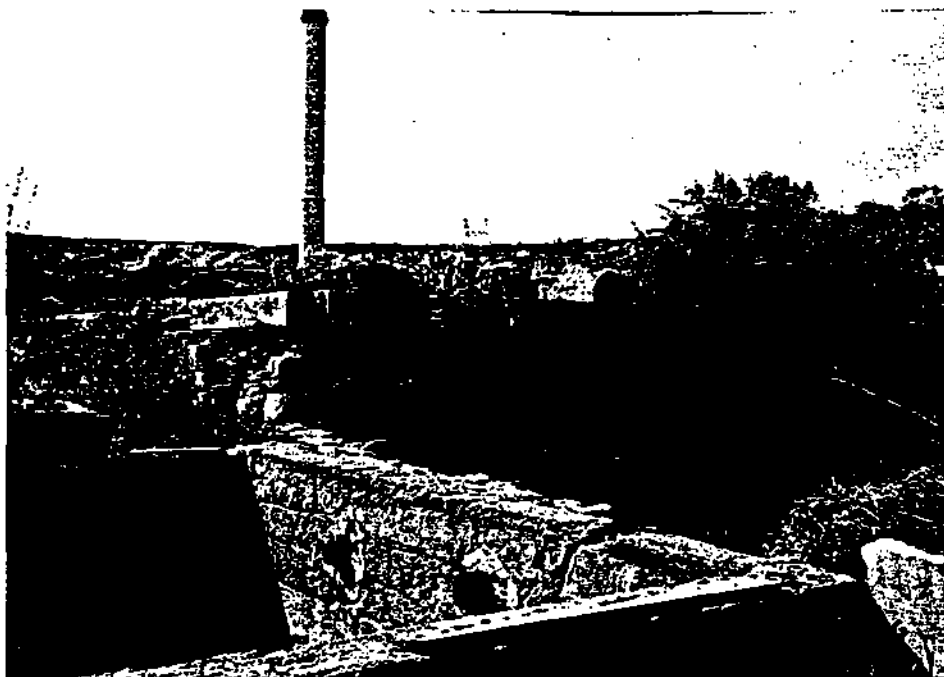
Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/19/94

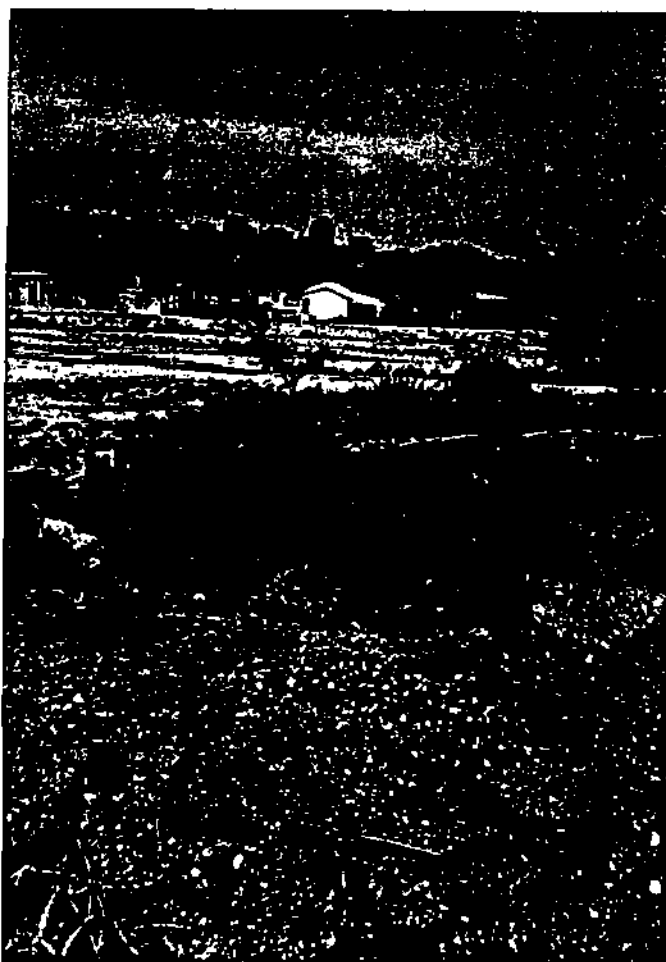
Time 0920

Direction ESE

Description Wall at center right is east wall of the filter basement in the "slime" room of the millsite. Sample GH-SO-4 was collected near the east wall.

Photo No.

20



Photographer/Witness Mark Lunsford

Date 5/18/94 Time 1620 Direction East

Description View of sample location GH-SO-5 on side of gully at the base of the northeast face of the tailings pile. Tailings depositon area and A-1 Mobile Village are in the background.

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Photo No.

21



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Mark Lunsford

Date 5/18/94

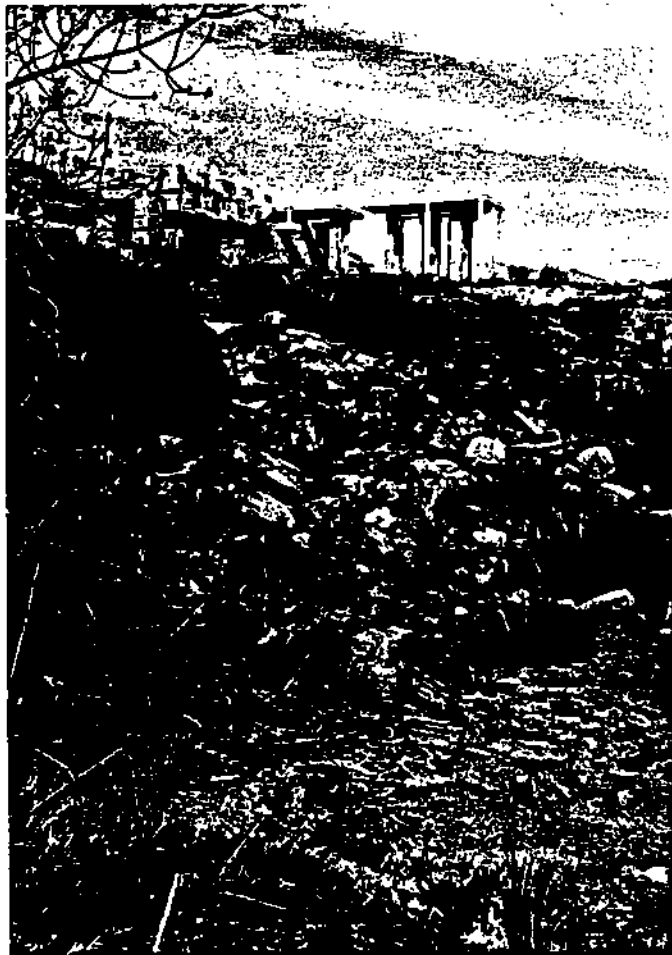
Time 1625

Direction East

Description View of sample location GH-SO-6. Rust-brown layer at top is probably cover material. Rest of material in gully is suspected "flotation" tailings.

Photo No.

22



Photographer/Witness Mark Lunsford

Date 5/19/94 Time 0930 Direction West

Description View of sample location GH-SO-8 looking toward roasting furnace at the millsite.

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Photo No.

23



Photographer/Witness Mark Lunsford
Date 5/19/94 Time 0955 Direction Southeast
Description View of sample location GH-SO-9
in basin northwest of millsite looking toward
mill stack. Concrete platforms at right are by
roasting furnace.

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photo No.

24



Photographer/Witness Mark Lunsford

Date 5/18/94 Time 1505 Direction West

Description Sample GH-SO-10 was collected approximately 5 feet from trailer unit 29A5.

Northeast face of tailings pile is in the background.

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Photo No.

25

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



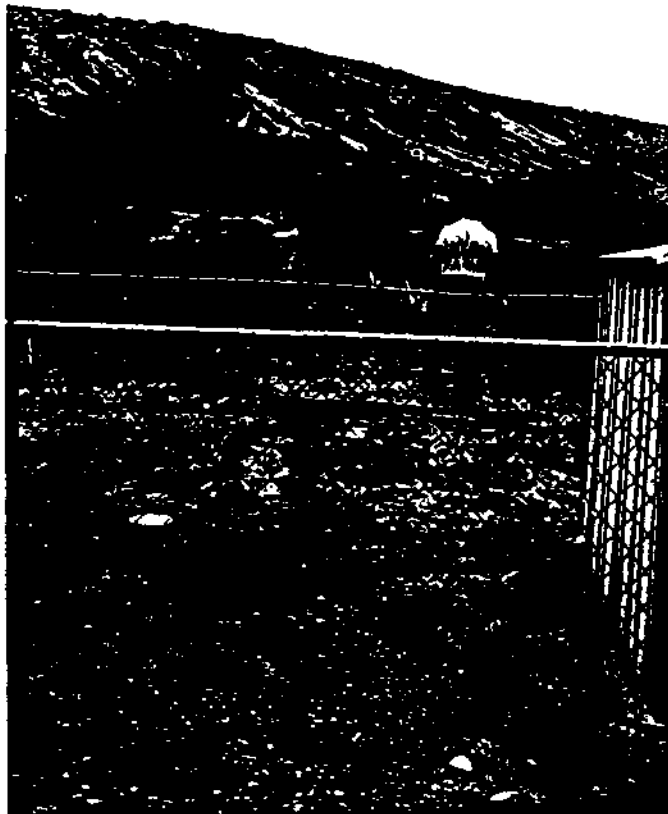
Photographer/Witness Mark Lunsford

Date 5/18/94 Time 1510 Direction West

Description Sample GH-SO-11 was collected
approximately 10 feet from trailer unit 31A (at
left). Northeast face of tailings pile is in
background.

Photo No.

26



Photographer/Witness Mark Lunsford

Date 5/18/94 Time 1520 Direction West

Description Sample GH-SO-12 was collected
west of fence between trailer units 33A and
34A at A-1 Mobile Village.

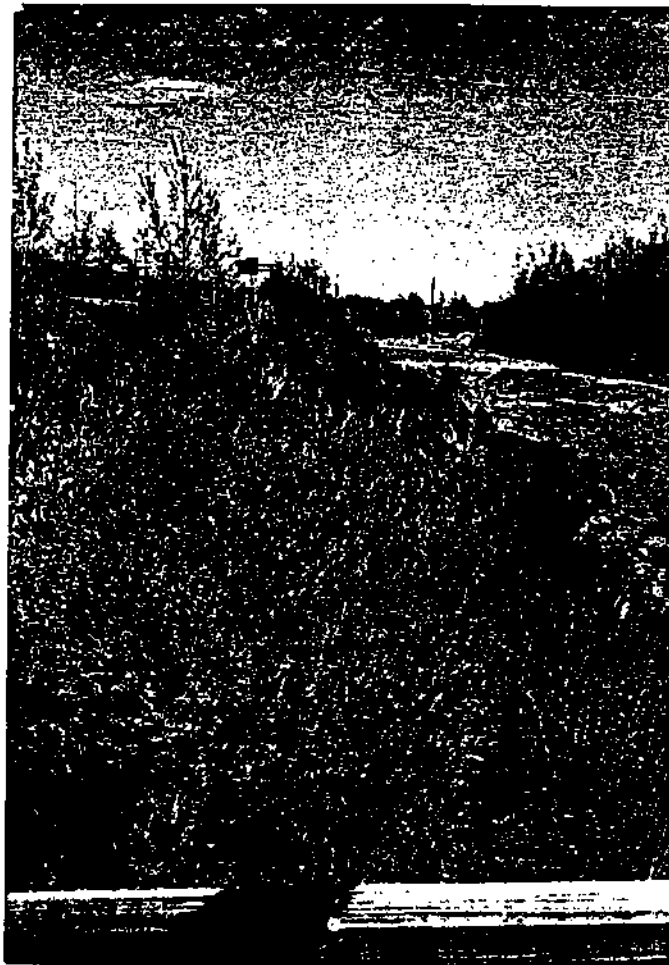
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Photo No.

27



Photographer/Witness Mark Lunsford
Date 5/11/94 Time _____ Direction North
Description Looking north from power plant
bridge along west bank of Fountain Creek
below the confluence with Monument Creek.
West bank is a sand bar willow (scrub-shrub)
wetland.

Site Name:
Gold Hill Tailings

Location:
Colorado Springs,
Colorado

CERCLIS #:
COD983801275

Photo No.

28



Photographer/Witness Mark Lunsford
Date 5/11/94 Time _____ Direction South
Description View of Monument Creek downstream (south) from RR bridge north of
confluence with Fountain Creek. Line of young willow trees on east bank (at left) demarcates
edge of wetland fringe.

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Photo No.

29

Site Name:

Gold Hill Tailings

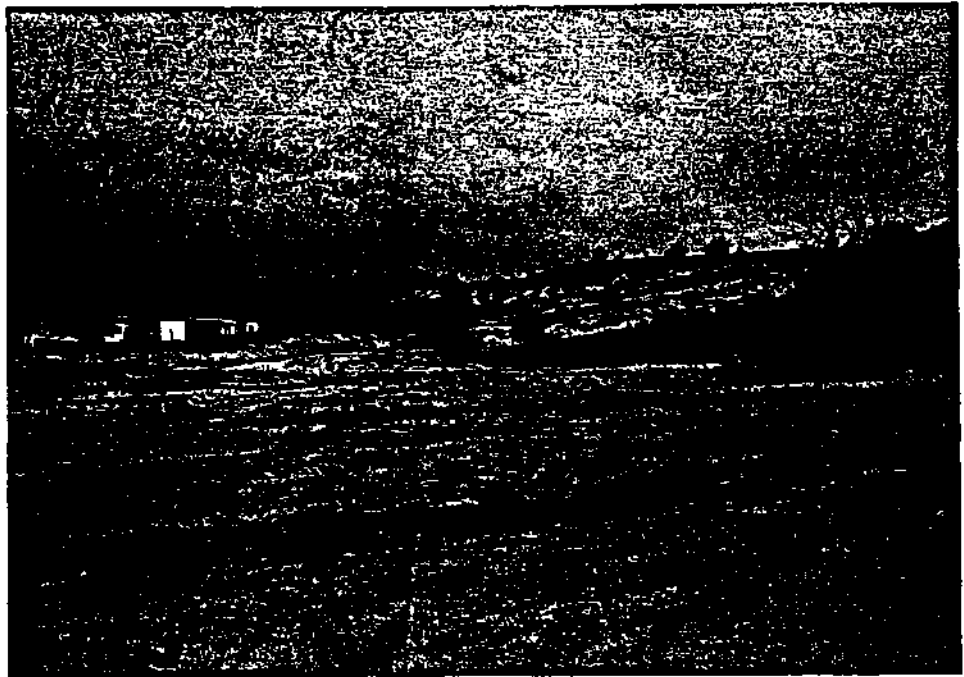
Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/18/94

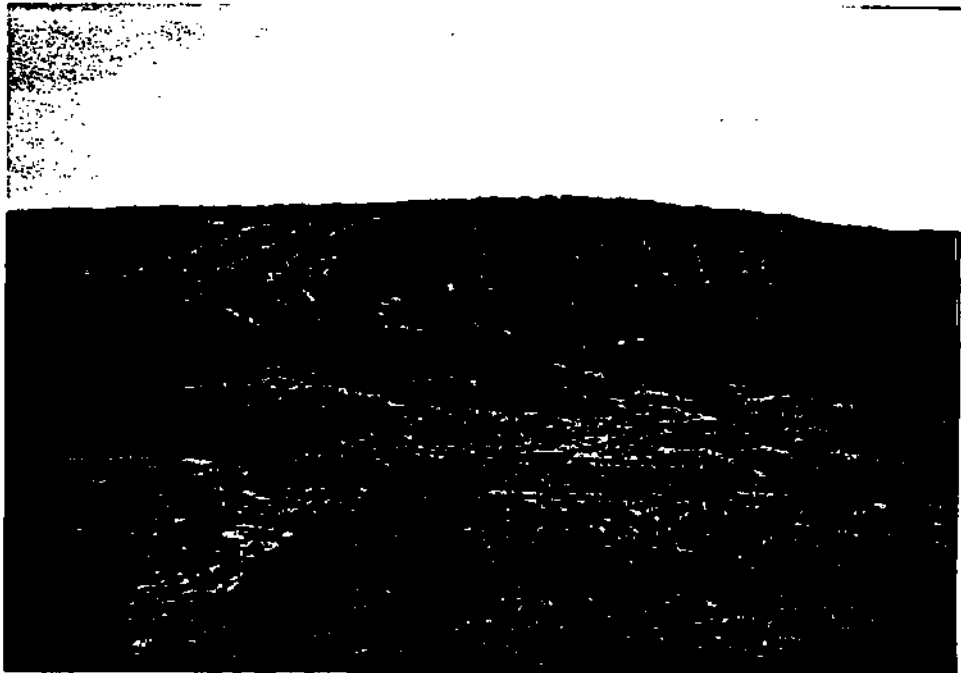
Time _____

Direction South

Description Southeast part of the northeast face of the tailings pile. A-1 Mobile Village
is at the left.

Photo No.

30



Photographer/Witness Mark Lunsford

Date 5/18/94

Time _____

Direction Southwest

Description Central part of the northeast face of the tailings pile.

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Photo No.

31

Site Name:

Gold Hill Tailings

Location:

Colorado Springs

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Wesley Hill

Date 5/18/94

Time

Direction Southwest

Description Children playing in tailings deposition area near A-1 Mobile Village/
site boundary.

Photo No.

32



Photographer/Witness Mark Lunsford

Date 5/19/94

Time

Direction ESE

Description Youths in the vicinity of the former Tin Box and Precipitating Rooms at
the millsite.

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Photo No.

33

Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275



Photographer/Witness Mark Lunsford

Date 5/11/94 Time 1515 Direction South

Description Motorcyclist onsite. Soil bank in foreground is along Fountain Creek. Dark grayish layer in upper part of bank are charcoal/ash cinder/chinker layers

Photo No.

34



Photographer/Witness Mark Lunsford

Date 5/19/94 Time _____ Direction _____

Description View of cylindrical steel tank in the ore bin area of the millsite. The tank was apparently empty.

Page 17

Of 18



Photo No.

35



Site Name:

Gold Hill Tailings

Location:

Colorado Springs,

Colorado

CERCLIS #:

COD983801275

Photographer/Witness Mark Lunsford

Date 5/19/94

Time _____

Direction Northwest

Description View of ore bin area of millsite.

Page 18

Of 18

APPENDIX B
LABORATORY DATA SHEETS AND DATA VALIDATION REPORT



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

Ref: 8ES-MEB

MEMORANDUM

AUG 26 1994

TO: Pat Smith
8HWM-SM

FROM: Kenneth Wang *KW*
Data Validation Chemist
Environmental Services Division, Multi-Media Enforcement
Branch, Analytical Operations Section (ESD, MEB, AOS)

SUBJECT: Data Validation for Gold Hill Tailings, Case #22102,
SDG #MHBM81

The Environmental Services Assistance Team (ESAT) has completed its review of data from the analysis of ten water samples for total metals and cyanide under the Contract Laboratory Program (CLP) Routine Analytical Services (RAS) for Gold Hill Tailings, case #22102, Sample Delivery Group (SDG) #MHBM81. ESD has evaluated the ESAT's Data Validation and agrees with ESAT's review of the data package. Data in the enclosed package are acceptable with the qualifiers added to the data reports. Please note all the cyanide values for all the water samples were incorrect in all the Form I. I corrected all the cyanide results to 10 ug/L because all the cyanide results were at a factor of 50 times greater than normal due to the initial volume being reported as 1 ml instead of the actual 50 ml. The laboratory resubmitted Forms I, III, V, VI VII and XIII. Please refer to the attached ICF Technology Inc. data validation report including the narrative summary and comments for a full explanation of the data review findings.

If you have any questions, or if I can be of further assistance, please contact me at 294-1055.

Attachments



Printed on Recycled Paper

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

02

MHBM94

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHBM74

Matrix (soil/water): SOIL Lab Sample ID: 1876312

Level (low/med): LOW Date Received: 05/20/94

% Solids: 94.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3460		*	F
7440-36-0	Antimony	7.0	B	N	F
7440-38-2	Arsenic	103			F
7440-39-3	Barium	145		N	F
7440-41-7	Beryllium	0.39	B		F
7440-43-9	Cadmium	1.6			F
7440-70-2	Calcium	1810			F
7440-47-3	Chromium	6.0			F
7440-48-4	Cobalt	2.4	B		F
7440-50-8	Copper	81.5		N	F
7439-89-6	Iron	40600			F
7439-92-1	Lead	684			F
7439-95-4	Magnesium	817	B		F
7439-96-5	Manganese	229			F
7439-97-6	Mercury	0.17			CV
7440-02-0	Nickel	4.9	B		F
7440-09-7	Potassium	2290			F
7782-49-2	Selenium	3.4		*	F
7440-22-4	Silver	5.2			F
7440-23-5	Sodium	246	B	E	F
7440-28-0	Thallium	3.0			F
7440-62-2	Vanadium	41.5		N	F
7440-66-6	Zinc	338		E	F
	Cyanide	1.7		*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

FORM I - IN

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MP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 02

MHBM93

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHBM74

Matrix (soil/water): SOIL Lab Sample ID: 1876311

Level (low/med): LOW Date Received: 05/20/94

% Solids: 98.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2670		*	F
7440-36-0	Antimony	9.5	B	N	F
7440-38-2	Arsenic	102			F
7440-39-3	Barium	167		N	F
7440-41-7	Beryllium	0.30	B		F
7440-43-9	Cadmium	1.9			F
7440-70-2	Calcium	1890			F
7440-47-3	Chromium	5.6			F
7440-48-4	Cobalt	2.5	B		F
7440-50-8	Copper	66.6		N	F
7439-89-6	Iron	35000			F
7439-92-1	Lead	779			F
7439-95-4	Magnesium	859	B		F
7439-96-5	Manganese	250			F
7439-97-6	Mercury	0.19			CV
7440-02-0	Nickel	7.1	B		F
7440-09-7	Potassium	2940			F
7782-49-2	Selenium	4.2		*	F
7440-22-4	Silver	5.8			F
7440-23-5	Sodium	265	B	E	F
7440-28-0	Thallium	3.6			F
7440-62-2	Vanadium	39.9		N	F
7440-66-6	Zinc	280		E	F
	Cyanide	1.6		*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

JP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

02

MHBM92

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1876310_____

Level (low/med): LOW_____ Date Received: 05/20/94

% Solids: 96.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1820		*	F
7440-36-0	Antimony	6.0	B	N	F
7440-38-2	Arsenic	73.8			F
7440-39-3	Barium	159		N	F
7440-41-7	Beryllium	0.24	B		F
7440-43-9	Cadmium	0.97	B		F
7440-70-2	Calcium	729	B		F
7440-47-3	Chromium	4.0			F
7440-48-4	Cobalt	2.5	B		F
7440-50-8	Copper	38.9		N	F
7439-89-6	Iron	29000			F
7439-92-1	Lead	628			F
7439-95-4	Magnesium	422	B		F
7439-96-5	Manganese	159			F
7439-97-6	Mercury	0.10	U		CV
7440-02-0	Nickel	4.4	B		F
7440-09-7	Potassium	2000			F
7782-49-2	Selenium	1.6		*	F
7440-22-4	Silver	4.3			F
7440-23-5	Sodium	238	B	E	F
7440-28-0	Thallium	2.1	B		F
7440-62-2	Vanadium	36.6		N	F
7440-66-6	Zinc	186		E	F
	Cyanide	1.0		*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

0

MHBM91

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1875018_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: 86.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1870		*	P
7440-36-0	Antimony	3.0	U	N	P
7440-38-2	Arsenic	38.4			P
7440-39-3	Barium	86.4		N	P
7440-41-7	Beryllium	0.42	B		P
7440-43-9	Cadmium	0.99	B		P
7440-70-2	Calcium	3270			P
7440-47-3	Chromium	4.3	/		P
7440-48-4	Cobalt	1.2	U		P
7440-50-8	Copper	22.4		N	P
7439-89-6	Iron	12500			P
7439-92-1	Lead	137			P
7439-95-4	Magnesium	1020	B		P
7439-96-5	Manganese	201			P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	3.0	B		P
7440-09-7	Potassium	813	B		P
7782-49-2	Selenium	9.9		*	P
7440-22-4	Silver	1.8	B		P
7440-23-5	Sodium	178	B	E	P
7440-28-0	Thallium	2.1	/		P
7440-62-2	Vanadium	18.6		N	P
7440-66-6	Zinc	136		E	P
	Cyanide	0.66		*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS_____ Clarity After: _____ Artifacts: _____

Comments:

MP 7/17/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHBM80

Lab Name: SOUTHWEST LAB OF OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1875007_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: 87.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	528		*	P
7440-36-0	Antimony	3.0	U	N	P
7440-38-2	Arsenic	0.78	B		P
7440-39-3	Barium	11.2	B	N	P
7440-41-7	Beryllium	0.23	U		P
7440-43-9	Cadmium	0.68	U		P
7440-70-2	Calcium	969	B		P
7440-47-3	Chromium	1.3	B		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	1.2	B	N	P
7439-89-6	Iron	2040			P
7439-92-1	Lead	2.4			P
7439-95-4	Magnesium	184	B		P
7439-96-5	Manganese	87.0			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	2.5	U		P
7440-09-7	Potassium	80.7	U		P
7782-49-2	Selenium	4.3		*	P
7440-22-4	Silver	0.46	U		P
7440-23-5	Sodium	117	B	E	P
7440-28-0	Thallium	1.2	B		P
7440-62-2	Vanadium	2.7	B	N	P
7440-66-6	Zinc	6.9		E	P
	Cyanide	0.57	U	*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS_____ Clarity After: _____ Artifacts: _____

Comments:

MP 7/17/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 01

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

MHB79

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHB74

Matrix (soil/water): SOIL Lab Sample ID: 1875006

Level (low/med): LOW Date Received: 05/19/94

% Solids: 84.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	686		*	P
7440-36-0	Antimony	3.1	U	N	P
7440-38-2	Arsenic	2.9			P
7440-39-3	Barium	17.8	B	N	P
7440-41-7	Beryllium	0.39	B		P
7440-43-9	Cadmium	0.71	U		P
7440-70-2	Calcium	3950			P
7440-47-3	Chromium	1.7	B		P
7440-48-4	Cobalt	1.2	U		P
7440-50-8	Copper	2.8	B	N	P
7439-89-6	Iron	7870			P
7439-92-1	Lead	4.8			P
7439-95-4	Magnesium	1460			P
7439-96-5	Manganese	193			P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	3.0	B		P
7440-09-7	Potassium	203	B		P
7782-49-2	Selenium	11.6		*	P
7440-22-4	Silver	0.64	B		P
7440-23-5	Sodium	114	B	E	P
7440-28-0	Thallium	1.4	B		P
7440-62-2	Vanadium	4.8	B	N	P
7440-66-6	Zinc	19.6		E	P
	Cyanide	0.60	U	*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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4/17/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

03

MHBM78

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1875005_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: 83.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1040		*	P
7440-36-0	Antimony	3.1	U	N	P
7440-38-2	Arsenic	1.6	B		P
7440-39-3	Barium	27.8	B	N	P
7440-41-7	Beryllium	0.39	B		P
7440-43-9	Cadmium	0.72	U		P
7440-70-2	Calcium	7280			P
7440-47-3	Chromium	1.4	B		P
7440-48-4	Cobalt	1.2	U		P
7440-50-8	Copper	1.5	B	N	P
7439-89-6	Iron	3610			P
7439-92-1	Lead	4.3			P
7439-95-4	Magnesium	1510			P
7439-96-5	Manganese	122			P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	2.6	U		P
7440-09-7	Potassium	450	B		P
7782-49-2	Selenium	17.2		*	P
7440-22-4	Silver	0.48	U		P
7440-23-5	Sodium	124	B	E	P
7440-28-0	Thallium	1.2	B		P
7440-62-2	Vanadium	2.3	B	N	P
7440-66-6	Zinc	17.4		E	P
	Cyanide	0.60	U	*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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JLP 7/17/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

01

MHBM77

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1875004_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: 86.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1520		*	P
7440-36-0	Antimony	3.0	U	N	P
7440-38-2	Arsenic	4.6			P
7440-39-3	Barium	30.5	B	N	P
7440-41-7	Beryllium	0.48	B		P
7440-43-9	Cadmium	0.70	U		P
7440-70-2	Calcium	16100			P
7440-47-3	Chromium	3.0	/		P
7440-48-4	Cobalt	1.2	U		P
7440-50-8	Copper	2.5	B	N	P
7439-89-6	Iron	5380			P
7439-92-1	Lead	11.1			P
7439-95-4	Magnesium	2140			P
7439-96-5	Manganese	183			P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	2.6	B		P
7440-09-7	Potassium	519	B		P
7782-49-2	Selenium	24.3		*	P
7440-22-4	Silver	0.61	B		P
7440-23-5	Sodium	146	B	E	P
7440-28-0	Thallium	1.4	/		P
7440-62-2	Vanadium	4.3	B	N	P
7440-66-6	Zinc	23.8		E	P
	Cyanide	0.58	U	*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS_____ Clarity After: _____ Artifacts: _____

Comments:

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MP7/17

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 01

MHEM76

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102_ SAS No.: _____ SDG No.: MHEM74

Matrix (soil/water): SOIL___ Lab Sample ID: 1675003___

Level (low/med): LOW___ Date Received: 05/19/94

% Solids: 79.9

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8770		*	P
7440-36-0	Antimony	3.3	U	N	P
7440-38-2	Arsenic	150			P
7440-39-3	Barium	442		N	P
7440-41-7	Beryllium	1.9			P
7440-43-9	Cadmium	1.4			P
7440-70-2	Calcium	13200			P
7440-47-3	Chromium	14.8			P
7440-48-4	Cobalt	6.1	B		P
7440-50-8	Copper	27.1		N	P
7439-89-6	Iron	21500			P
7439-92-1	Lead	100			P
7439-95-4	Magnesium	4310			P
7439-96-5	Manganese	1130			P
7439-97-6	Mercury	0.19			CV
7440-02-0	Nickel	11.9			P
7440-09-7	Potassium	3270			P
7782-49-2	Selenium	23.4		*	P
7440-22-4	Silver	2.7			P
7440-23-5	Sodium	313	B	E	P
7440-28-0	Thallium	4.2	/		P
7440-62-2	Vanadium	70.9		N	P
7440-66-6	Zinc	293		E	P
	Cyanide	3.5		*	CA

Color Before: BROWN___ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

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wp7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 01

MHBM75

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102___ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL___ Lab Sample ID: 1875002___

Level (low/med): LOW___ Date Received: 05/19/94

% Solids: 73.4

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	11500		*	P
7440-36-0	Antimony	3.5	U	N	P
7440-38-2	Arsenic	99.4			P
7440-39-3	Barium	332		N	P
7440-41-7	Beryllium	1.4	B		P
7440-43-9	Cadmium	1.5			P
7440-70-2	Calcium	13600			P
7440-47-3	Chromium	14.7			P
7440-48-4	Cobalt	7.1	B		P
7440-50-8	Copper	19.7		N	P
7439-89-6	Iron	21700			P
7439-92-1	Lead	60.1			P
7439-95-4	Magnesium	4640			P
7439-96-5	Manganese	681			P
7439-97-6	Mercury	0.14	U		CV
7440-02-0	Nickel	16.3			P
7440-09-7	Potassium	2560			P
7782-49-2	Selenium	25.2		*	P
7440-22-4	Silver	1.4	B		P
7440-23-5	Sodium	252	B	E	P
7440-28-0	Thallium	4.4	/		P
7440-62-2	Vanadium	45.3		N	P
7440-66-6	Zinc	184		E	P
	Cyanide	0.68	U	*	CA

Color Before: BROWN___ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

wp 7/17/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 0

MHBM74

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHBM74

Matrix (soil/water): SOIL Lab Sample ID: 1875001

Level (low/med): LOW Date Received: 05/19/94

% Solids: 94.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	675		*	P
7440-36-0	Antimony	2.8	U	N	P
7440-38-2	Arsenic	1.3	B		P
7440-39-3	Barium	9.3	B	N	P
7440-41-7	Beryllium	0.28	B		P
7440-43-9	Cadmium	0.64	U		P
7440-70-2	Calcium	45900			P
7440-47-3	Chromium	1.9	B		P
7440-48-4	Cobalt	1.1	U		P
7440-50-8	Copper	2.8	B	N	P
7439-89-6	Iron	2560			P
7439-92-1	Lead	2.3			P
7439-95-4	Magnesium	1760			P
7439-96-5	Manganese	76.4			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	2.3	U		P
7440-09-7	Potassium	234	B		P
7782-49-2	Selenium	23.4		*	P
7440-22-4	Silver	0.43	U		P
7440-23-5	Sodium	120	B	E	P
7440-28-0	Thallium	1.2	B		P
7440-62-2	Vanadium	1.1	B	N	P
7440-66-6	Zinc	12.7		E	P
	Cyanide	0.53	U	*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

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MP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 01

MHBM73

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1876309_____

Level (low/med): LOW_____ Date Received: 05/20/94

% Solids: 78.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	16900		*	P
7440-36-0	Antimony	3.3	U	N	P
7440-38-2	Arsenic	33.0			P
7440-39-3	Barium	232		N	P
7440-41-7	Beryllium	1.9			P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	15900			P
7440-47-3	Chromium	19.9			P
7440-48-4	Cobalt	12.6	B		P
7440-50-8	Copper	39.1		N	P
7439-89-6	Iron	30100			P
7439-92-1	Lead	107			P
7439-95-4	Magnesium	6940			P
7439-96-5	Manganese	1190			P
7439-97-6	Mercury	0.38			CV
7440-02-0	Nickel	28.8			P
7440-09-7	Potassium	4110			P
7782-49-2	Selenium	25.4		*	P
7440-22-4	Silver	2.3	B		P
7440-23-5	Sodium	300	B	E	P
7440-28-0	Thallium	4.1	/		P
7440-62-2	Vanadium	48.8		N	P
7440-66-6	Zinc	186		E	P
	Cyanide	0.64	U	*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

7/17/94

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 01

MHBM72

Lab Name: SOUTHWEST LAB OF OK _____ Contract: 68-D2-0040

Lab Code: SWOK _____ Case No.: 22102 _____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL _____ Lab Sample ID: 1876308 _____

Level (low/med): LOW _____ Date Received: 05/20/94

% Solids: 92.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	4380		*	P
7440-36-0	Antimony	13.1		N	P
7440-38-2	Arsenic	181			P
7440-39-3	Barium	267		N	P
7440-41-7	Beryllium	0.59	B		P
7440-43-9	Cadmium	4.0			P
7440-70-2	Calcium	8320			P
7440-47-3	Chromium	11.4			P
7440-48-4	Cobalt	3.5	B		P
7440-50-8	Copper	107		N	P
7439-89-6	Iron	50700			P
7439-92-1	Lead	1630			P
7439-95-4	Magnesium	699	B		P
7439-96-5	Manganese	600			P
7439-97-6	Mercury	2.2			CV
7440-02-0	Nickel	6.6	B		P
7440-09-7	Potassium	2570			P
7782-49-2	Selenium	15.9		*	P
7440-22-4	Silver	10.2			P
7440-23-5	Sodium	907	B	E	P
7440-28-0	Thallium	4.6			P
7440-62-2	Vanadium	47.9		N	P
7440-66-6	Zinc	703		E	P
	Cyanide	8.0		*	CA

Color Before: BROWN _____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ILM02.1

MP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 00

MHB71

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHB74

Matrix (soil/water): SOIL Lab Sample ID: 1876307

Level (low/med): LOW Date Received: 05/20/94

% Solids: 95.0

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9620		*	P
7440-36-0	Antimony	6.0	B	N	P
7440-38-2	Arsenic	290			P
7440-39-3	Barium	355		N	P
7440-41-7	Beryllium	2.0			P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	10300			P
7440-47-3	Chromium	21.2			P
7440-48-4	Cobalt	7.0	B		P
7440-50-8	Copper	22.8		N	P
7439-89-6	Iron	20000			P
7439-92-1	Lead	58.0			P
7439-95-4	Magnesium	5300			P
7439-96-5	Manganese	1310			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	14.9			P
7440-09-7	Potassium	4600			P
7782-49-2	Selenium	18.2		*	P
7440-22-4	Silver	2.9			P
7440-23-5	Sodium	530	B	E	P
7440-28-0	Thallium	4.5			P
7440-62-2	Vanadium	165		N	P
7440-66-6	Zinc	260		E	P
	Cyanide	1.4		*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

HP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 00

MHM70

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHM74

Matrix (soil/water): SOIL_____ Lab Sample ID: 1876306_____

Level (low/med): LOW_____ Date Received: 05/20/94

% Solids: 94.2

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2240		*	P
7440-36-0	Antimony	12.6	B	N	P
7440-38-2	Arsenic	95.8			P
7440-39-3	Barium	194		N	P
7440-41-7	Beryllium	0.45	B		P
7440-43-9	Cadmium	1.9			P
7440-70-2	Calcium	8270			P
7440-47-3	Chromium	3.1	/		P
7440-48-4	Cobalt	1.6	B		P
7440-50-8	Copper	69.0		N	P
7439-89-6	Iron	45300			P
7439-92-1	Lead	1240			P
7439-95-4	Magnesium	569	B		P
7439-96-5	Manganese	291			P
7439-97-6	Mercury	0.34			CV
7440-02-0	Nickel	2.9	B		P
7440-09-7	Potassium	4320			P
7782-49-2	Selenium	15.2		*	P
7440-22-4	Silver	9.3			P
7440-23-5	Sodium	452	B	E	P
7440-28-0	Thallium	3.7	/		P
7440-62-2	Vanadium	47.4		N	P
7440-66-6	Zinc	348		E	P
	Cyanide	3.7		*	CA

Color Before: BROWN_____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ILM02.1

mp 7/17/94

INORGANIC ANALYSES DATA SHEET

MHEM69

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHEM74

Matrix (soil/water): SOIL Lab Sample ID: 1876305

Level (low/med): LOW Date Received: 05/20/94

% Solids: 93.6

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	7340		*	F
7440-36-0	Antimony	3.3	B	N	F
7440-38-2	Arsenic	157			F
7440-39-3	Barium	203		N	F
7440-41-7	Beryllium	1.5			F
7440-43-9	Cadmium	3.4			F
7440-70-2	Calcium	11200			F
7440-47-3	Chromium	15.4			F
7440-48-4	Cobalt	5.7	B		F
7440-50-8	Copper	58.0		N	F
7439-89-6	Iron	17700			F
7439-92-1	Lead	98.3			F
7439-95-4	Magnesium	3700			F
7439-96-5	Manganese	1200			F
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	14.4			F
7440-09-7	Potassium	3590			F
7782-49-2	Selenium	19.8		*	F
7440-22-4	Silver	3.9			F
7440-23-5	Sodium	339	B	E	F
7440-28-0	Thallium	4.5			F
7440-62-2	Vanadium	93.4		N	F
7440-66-6	Zinc	639		E	F
	Cyanide	25.4		*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

HP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 0

MHBM68

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102___ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL___ Lab Sample ID: 1876304___

Level (low/med): LOW___ Date Received: 05/20/94

% Solids: 78.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	6730		*	P
7440-36-0	Antimony	10.0	B	N	P
7440-38-2	Arsenic	385			P
7440-39-3	Barium	241		N	P
7440-41-7	Beryllium	1.2	B		P
7440-43-9	Cadmium	6.2			P
7440-70-2	Calcium	137000			P
7440-47-3	Chromium	12.9			P
7440-48-4	Cobalt	3.0	B		P
7440-50-8	Copper	86.1		N	P
7439-89-6	Iron	17100			P
7439-92-1	Lead	1510			P
7439-95-4	Magnesium	8740			P
7439-96-5	Manganese	776			P
7439-97-6	Mercury	4.7			CV
7440-02-0	Nickel	9.6	B		P
7440-09-7	Potassium	1790			P
7782-49-2	Selenium	9.0		*	P
7440-22-4	Silver	3.5			P
7440-23-5	Sodium	476	B	E	P
7440-28-0	Thallium	2.6	✓		P
7440-62-2	Vanadium	164		N	P
7440-66-6	Zinc	3720		E	P
	Cyanide	393		*	CA

Color Before: BROWN___ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

inf 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

00

MHBM67

Lab Name: SOUTHWEST LAB OF OK _____ Contract: 68-D2-0040

Lab Code: SWOK _____ Case No.: 22102 _____ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL _____ Lab Sample ID: 1876303 _____

Level (low/med): LOW _____ Date Received: 05/20/94

% Solids: 81.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	36100		*	P
7440-36-0	Antimony	3.2	U	N	P
7440-38-2	Arsenic	21.5			P
7440-39-3	Barium	521		N	P
7440-41-7	Beryllium	4.3			P
7440-43-9	Cadmium	1.3			P
7440-70-2	Calcium	142000			P
7440-47-3	Chromium	14.8			P
7440-48-4	Cobalt	8.7	B		P
7440-50-8	Copper	41.2		N	P
7439-89-6	Iron	45400			P
7439-92-1	Lead	20.5			P
7439-95-4	Magnesium	15900			P
7439-96-5	Manganese	953			P
7439-97-6	Mercury	0.22			CV
7440-02-0	Nickel	20.2			P
7440-09-7	Potassium	2700			P
7782-49-2	Selenium	1.4		*	P
7440-22-4	Silver	1.8	B		P
7440-23-5	Sodium	1920		E	P
7440-28-0	Thallium	4.6			P
7440-62-2	Vanadium	50.1		N	P
7440-66-6	Zinc	38.5		E	P
	Cyanide	1.5		*	CA

Color Before: BROWN _____ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS _____ Clarity After: _____ Artifacts: _____

Comments:

FORM I - IN

ILMO2.1

wp7/17/94

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INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 00

MHBM66

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHBM74

Matrix (soil/water): SOIL Lab Sample ID: 1876302

Level (low/med): LOW Date Received: 05/20/94

% Solids: 81.8

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	8360		*	P
7440-36-0	Antimony	3.2	U	N	P
7440-38-2	Arsenic	6.8			P
7440-39-3	Barium	97.7		N	P
7440-41-7	Beryllium	0.93	B		P
7440-43-9	Cadmium	0.75	B		P
7440-70-2	Calcium	5450			P
7440-47-3	Chromium	10.4			P
7440-48-4	Cobalt	3.7	B		P
7440-50-8	Copper	12.1		N	P
7439-89-6	Iron	12400			P
7439-92-1	Lead	42.3			P
7439-95-4	Magnesium	2520			P
7439-96-5	Manganese	331			P
7439-97-6	Mercury	0.12	U		CV
7440-02-0	Nickel	9.3	B		P
7440-09-7	Potassium	2390			P
7782-49-2	Selenium	15.2		*	P
7440-22-4	Silver	0.98	B		P
7440-23-5	Sodium	126	B	E	P
7440-28-0	Thallium	2.6			P
7440-62-2	Vanadium	19.9		N	P
7440-66-6	Zinc	87.5		E	P
	Cyanide	0.61	U	*	CA

Color Before: BROWN Clarity Before: Texture: MEDIUM

Color After: COLORLESS Clarity After: Artifacts:

Comments:

FORM I - IN

ILMO2.1

MP 7/17/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO-003

MHBM65

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102___ SAS No.: _____ SDG No.: MHBM74

Matrix (soil/water): SOIL___ Lab Sample ID: 1876301___

Level (low/med): LOW___ Date Received: 05/20/94

% Solids: 93.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	9950		*	P
7440-36-0	Antimony	2.8	B	N	P
7440-38-2	Arsenic	12.2			P
7440-39-3	Barium	102		N	P
7440-41-7	Beryllium	1.2			P
7440-43-9	Cadmium	1.4			P
7440-70-2	Calcium	6840			P
7440-47-3	Chromium	24.7			P
7440-48-4	Cobalt	3.7	B		P
7440-50-8	Copper	12.4		N	P
7439-89-6	Iron	16200			P
7439-92-1	Lead	175			P
7439-95-4	Magnesium	2480			P
7439-96-5	Manganese	273			P
7439-97-6	Mercury	0.11	U		CV
7440-02-0	Nickel	10.7			P
7440-09-7	Potassium	2230			P
7782-49-2	Selenium	15.2		*	P
7440-22-4	Silver	1.2	B		P
7440-23-5	Sodium	138	B	E	P
7440-28-0	Thallium	2.0	X		P
7440-62-2	Vanadium	26.1		N	P
7440-66-6	Zinc	108		E	P
	Cyanide	0.54	U	*	CA

Color Before: BROWN___ Clarity Before: _____ Texture: MEDIUM

Color After: COLORLESS Clarity After: _____ Artifacts: _____

Comments:

MP7/17/94

INORGANIC DATA QUALITY ASSURANCE REVIEW

REGION VIII

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality. Use of additional qualifiers should be carefully considered. Definitions for all qualifiers used should be provided with each report.

GENERAL QUALIFIERS for use with both INORGANIC and ORGANIC DATA

- R - Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
- J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
- U J - The reported amount is estimated because Quality Control criteria were not met. Element or compound was not detected.

INORGANIC DATA QUALITY ASSURANCE REVIEW

Samples MHBM68 and MHBM69 were reanalyzed for cyanide at a 50X dilution and a 5X dilution, respectively; however, the raw data states that they used a 49X and 4X dilution, respectively. No action was taken.

Proper error correction procedures were not used on the percent solids determination sheet, page 229.

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 12 - ICP LINEAR RANGES

ICP linear ranges were reported.

Yes X No

Comments: None

LINEAR RANGE VERIFICATION ANALYSIS

Linear Range Verification Analysis (LRA) was performed and results were within control limits of $\pm 5\%$ of the true value.

Yes No N/A X

Comments: None

FORM 13 - PREPARATION LOG

Information on the preparation of samples for analysis was reported on Form XIII.

Yes X No Not Required

Comment: None

FORM 14 - ANALYSIS RUN LOG

A Form XIV with the required information was filled out for each analysis run in the data package.

Yes X No Not Required

Comments: None.

Additional Comments or Problems/Resolutions (not addressed above).

Arsenic, lead, selenium, and thallium were analyzed by ICP. The arsenic, selenium, and thallium analytes were not present in the ICSAB solution.

In the mercury run on 5/23/94, page 215, the laboratory cut out sequences 85 through 91, 94 through 100, and 102 through 103 from the raw data and taped together the remaining sequences. A run log was included, all necessary QC was included, and a time/date stamp demonstrated that all QC was ran appropriately; therefore, no qualifications were made.

INORGANIC DATA QUALITY ASSURANCE REVIEW

The serial dilution was without interference problems as defined by the SOW.

Yes ☐ No ☒

Comments: The following table lists the analytes with ICP serial dilution percent differences outside the control limits of ten percent with sample results >50XIDL, the initial sample and serial dilution results, the percent differences, and data qualifiers.

Element	INITIAL SAMPLE RESULT (ug/L)	SERIAL DILUTION RESULT (ug/L)	PERCENT DIFFERENCE	SAMPLES QUALIFIED - QUALIFIER
Sodium	1870.10	2416.17	29.2	All samples - J
Zinc	14581.77	16112.59	10.5	All samples - J

FORM 10 - QUARTERLY INSTRUMENT DETECTION LIMITS (IDL)

IDL's were provided for all elements on the target analyte list.

Yes ☐ No ☒

Comments: The laboratory did not provide an IDL for cyanide.

Reported IDL's met contract requirements.

Yes ☒ No ☐

Comments: The cyanide IDL was obtained from the EPA form I and the raw data. The IDL meets contract requirements.

FORM 11 - INTERELEMENT CORRECTION FACTORS FOR ICP

Interelement corrections for ICP were reported.

Yes ☒ No ☐ N/A ☐

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

Comments: The laboratory flagged aluminum and selenium for laboratory duplicates; however, the soil RPDs were within $\pm 35\%$.

For sample concentrations < 5 times the CRDL, duplicate analysis results were within the control window of \pm CRDL (2X CRDL for soils).

Yes X No

Comments: None

GFAA QC

GFAA analyses were not performed with this SDG.

FORM 7 - LABORATORY CONTROL SAMPLE

The laboratory control sample (LCS) was prepared and analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: The mercury laboratory control sample result is not present in the raw data.

All results were within the control limits.

Yes X No

Comments: The mercury laboratory control sample result is not present in the raw data and therefore could not be verified.

FORM 8 - STANDARD ADDITION RESULTS

GFAA analyses were not performed with this SDG.

FORM 9 - ICP QC

A serial dilution was performed for ICP analysis with every twenty or fewer samples of a similar matrix, or one per sample delivery group, whichever is more frequent.

Yes X No

Comments: None.

INORGANIC DATA QUALITY ASSURANCE REVIEW

ELEMENT	SPIKE RECOVERY	MATRIX	SAMPLES AFFECTED - QUALIFIERS
Antimony	49.7%	Soil	All Samples - J or UJ
Barium	72.7%	Soil	All Samples - J
Copper	55.0%	Soil	All Samples - J
Vanadium	71.1%	Soil	All Samples - J

FORM 5B - POST DIGEST SPIKE RECOVERY

A post-digest spike was performed for those elements that did not meet the specified criteria (i.e., Pre-digestion/pre-distillation spike recovery falls outside of control limits and sample result is less than four times the spike amount added, exception : Ag, Hg).

Yes X No Not Required

Comments: None

FORM 6 - DUPLICATE SAMPLE ANALYSIS

Duplicate sample analysis was performed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None

The RPDs were calculated correctly.

$$\text{RPD} = \frac{(S - D)}{(S + D)/2} \times 100$$

S = sample
D = duplicate

Yes X No

Comments: None

For sample concentrations >5 times the CRDL, RPDs were within ±20% (limits of ±35% apply for soil/sediments/tailings samples).

Yes X No N/A

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 4 - ICP INTERFERENCE CHECK SAMPLE

The ICP interference check sample (ICS) was run twice per eight hour shift and/or at the beginning and end of each sample set analysis sequence (whichever is more frequent).

Yes X No

Comments: None

Percent recovery of the analytes in solution ICSAB were within the range of 80-120%.

Yes X No

Comments: None

FORM 5A - MATRIX SPIKE SAMPLE ANALYSIS

A matrix spike sample was analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None

The percent recoveries (%R) were calculated correctly.

$$\% \text{ Recovery} = \frac{(SSR - SR)}{SA} \times 100$$

SSR = spiked sample result
SR = sample result
SA = spike added

Yes X No

Comments: None

Spike recoveries were within the range of 75 - 125% (an exception is granted where the sample concentration is 4 times the spike concentration).

Yes No X

Comments: The following table lists the spike recoveries outside control limits, matrix, samples affected, and data qualifiers.

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 3 - BLANKS

The initial and continuing calibration blanks (ICB and CCB, respectively) met contract requirements.

Yes X No

Comments: None

The continuing calibration blanks were run at 10% frequency.

Yes X No

Comments: None

A laboratory/preparation blank was run at the frequency of one per twenty samples, or per sample delivery group (whichever is more frequent), and for each matrix analyzed.

Yes X No

Comments: None

All analyzed blanks were free of contamination.

Yes No X

Comments: The following table lists the blanks with contamination, elements present, affected samples, and data qualifiers. Aluminum, arsenic, barium, calcium, chromium, iron, manganese, nickel, sodium, and zinc exhibited either positive or negative blank contamination above the absolute value of the IDL; however, all associated samples were either greater than five times the blank concentration or below the IDL. Therefore, no action was taken on these elements.

TYPE OF BLANK	ELEMENTS PRESENT, CONCENTRATION	SAMPLES AFFECTED - QUALIFIERS
Preparation Blank	Chromium, 0.95 mg/Kg	MHBM70, MHBM74, MHBM77, MHBM78, MHBM79, MHBM80, MHBM91, MHBM92 - UJ
CCB1	Thallium, 3.2 ug/L	ALL - UJ
CCB2	Thallium, 6.3 ug/L	
CCB3	Thallium, 6.6 ug/L	
Preparation Blank	Thallium, 1.4 mg/Kg	

INORGANIC DATA QUALITY ASSURANCE REVIEW

Comments: None

FORM 2A - INITIAL AND CONTINUING CALIBRATION VERIFICATION

The initial and continuing calibration verification standards (ICV and CCV, respectively) met contract requirements.

Yes X No

Comments: None

The calibration verification results were within 90-110% recovery for metals, 80-120 for mercury, and 85-115% for cyanide.

Yes X No

Comments: None

The continuing calibrations standards were run at 10% frequency.

Yes X No

Comments: None

FORM 2B - CRDL STANDARD FOR ICP AND AA

ICP Analysis: Standards (CRI) at 2X the CRDL or the IDL whichever were greater, were analyzed at the beginning and the end of each sample run, or at a minimum of twice per eight hour shift, whichever was more frequent.

Yes X No

Comments: None

GFAA Analysis: Standards (CRA) at 2X CRDL were analyzed at the beginning of each sample run.

Yes X No

Comments: None

The CRI and/or the CRA were analyzed after the ICV.

Yes X No N/A

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

HOLDING TIMES

All CLP-SOW holding times were met.

Yes X No

All 40 CFR Part 136 holding times were met.

Yes No X

Comments: Sample BHB69 was analyzed outside the technical holding time of fourteen days from the date of collection. The following table summarizes holding time violations and qualifiers added to the data.

SAMPLE NUMBER	DAYS OUTSIDE LIMITS	COMPOUNDS	QUALIFIERS
MHB69	1	Cyanide	J

INSTRUMENT CALIBRATION: STANDARDS AND BLANKS

Initial instrument calibrations were performed according to contract requirements.

Yes X No

Comments: None.

The instruments were calibrated daily and each time an analysis run was performed.

Yes X No

Comments: None

The instruments were calibrated using one blank and the appropriate number of standards.

Yes X No

Comments: None

FORM 1 - SAMPLE ANALYSIS RESULTS

Sample analyses were entered correctly on Form I's.

Yes X No

INORGANIC DATA QUALITY ASSURANCE REVIEW

SOW ILM02.1

RAS INORGANIC DELIVERABLES COMPLETENESS CHECKLIST

P Inorganic Cover Page
P Inorganic Analysis Data Sheets (Form I)
P Initial Calibration and Calibration Verification Results (Form II)
P Continuing Calibration Verification Results (Form II)
P CRDL Standard for ICP & AA (Form II, Part 2)
P Blank Analysis Results (Form III)
P ICP Interference Check Sample Results (Form IV)
P Spiked Sample Results (Form V)
P Post-digest Spiked Sample Analysis (Form V, Part 2)
P Duplicate Sample Results (Form VI)
P Instrument Detection Limits (Form VII) or (Form X - Quarterly)
P Laboratory Control Sample results (Form VII)
P Standard Addition Results (Form VIII)
P ICP Serial Dilution Results (Form IX)
NR Holding Times Summary Sheet (Form X)
P ICP Interelement Correction Factors (Form XII - Quarterly , or Form XI - Annually)
P ICP Linear Ranges (Form XII (XII) - Quarterly)
P Raw Data
 P Samples P Calibration Standards P Blanks P Spikes
 P Duplicates P ICP QC (ICS and Serial Dilution) P LCS
 NA Furnace AA P Mercury Analysis P Cyanide Analysis
P Percent Solids Calculations - Solids Only
P Sample Prep/Digestion Logs (Form XIII)
P Analysis Run Log (Form XIV)
P Traffic Report(s)
P Chain of Custody
P Sample Description
NP Case Narrative
P Method References

KEY: P = Provided in original data package, as required by contract
R = Provided as Resubmission
NP = Not provided in original data package or as resubmission
NR = Not required under contract
NA = Not applicable to this data package

Comments: None.

INORGANIC DATA QUALITY ASSURANCE REVIEW

REVIEW NARRATIVE SUMMARY

This data package was reviewed according to the EPA document "Laboratory Data Validation Functional Guidelines for Evaluating Inorganic Analyses", July 1, 1988. The data package, Case 22102 SDG MHBM74, consisted of twenty soil samples for CLP RAS metals analyses.

The following table lists the data qualifiers added to sample analyses.

SAMPLE ID	ELEMENTS - QUALIFIERS	PROBLEM	REVIEW SECTION
MHBM69	Cyanide - J	Holding Times	Holding Times
MHBM70, MHBM74, MHBM77, MHBM78, MHBM79, MHBM80, MHBM91, MHBM92	Chromium - UJ	Blank Contamination	Form 3
All Samples	Thallium - UJ	Blank Contamination	Form 3
All Samples	Antimony - J or UJ	Matrix Spike	Form 5A
All samples	Barium, Copper, Vanadium - J	Matrix Spike	Form 5A
All samples	Sodium, Zinc - J	ICP Serial Dilution	Form 9

SAMPLE ID	SAMPLE LOCATION	MATRIX
MHBM94	GH-SO-12	Soil

DATA QUALITY STATEMENT*

- () Data are ACCEPTABLE according to the Functional Guidelines with no qualifiers (flags) by the reviewer
 (X) Data are acceptable with QUALIFICATIONS noted in review
 () Data are UNACCEPTABLE according to the Functional Guidelines

Telephone/Communication Logs Enclosed? Yes ____ No X

TPO Attention Required? Yes X No ____

If yes, list the items that require attention: The laboratory did not provide an IDL for cyanide. The mercury laboratory control sample result is not present in the raw data.

* Please see Data Qualifier Definitions, attached to the end of this report.

Heidi J. Phillips (303) 980-2032

REGION VIII
RAS INORGANIC - SUMMARY OF CLP DATA QUALITY ASSURANCE REVIEW

CASE/SAS/LGN NO.	SITE NAME	OPERABLE UNIT
22102	Gold Hill Tailings	8ZZ/00
RPM NAME	ESAT TID - 08-9404-423	
Pat Smith	ESAT WUD - 130	

CONTRACTOR LABORATORY	CONTRACT NO.	SDG	LABORATORY TPO/REGION
Southwest Laboratory of OK	68-D2-0040	MHBM74	Ray Flores/06

REVIEW ASSIGNED DATE 06/23/94 DATA REVIEWER Heidi J. Phillips REVIEW COMPLETION DATE 07/20/94

SAMPLE ID	SAMPLE LOCATION	MATRIX
MHBM65	GH-SO-1	Soil
MHBM66	GH-SO-2	Soil
MHBM67	GH-SO-3	Soil
MHBM68	GH-SO-4	Soil
MHBM69	GH-SO-5	Soil
MHBM70	GH-SO-6	Soil
MHBM71	GH-SO-7	Soil
MHBM72	GH-SO-1	Soil
MHBM73	GH-SO-2	Soil
MHBM74	GH-SE-1	Soil
MHBM75	GH-SE-2	Soil
MHBM76	GH-SE-3	Soil
MHBM77	GH-SE-4	Soil
MHBM78	GH-SE-5	Soil
MHBM79	GH-SE-6	Soil
MHBM80	GH-SE-7	Soil
MHBM91	GH-SE-8	Soil
MHBM92	GH-SO-10	Soil
MHBM93	GH-SO-11	Soil



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII

999 18th STREET - SUITE 500
DENVER, COLORADO 80202-2466

Ref: 8ES-MEB

COPY

MEMORANDUM

TO: Pat Smith
8HWM-SM

AUG 23 1994

FROM: Kenneth Wang *KW*
Data Validation Chemist
Environmental Services Division, Multi-Media Enforcement
Branch, Analytical Operations Section (ESD, MEB, AOS)

SUBJECT: Data Validation for Gold Hill Tailings, Case #22102,
SDG #MHBM74

The Environmental Services Assistance Team (ESAT) has completed its review of data from the analysis of 20 soil samples for total metals and cyanide under the Contract Laboratory Program (CLP) Routine Analytical Services (RAS) for Gold Hill Tailings, case #22102, Sample Delivery Group (SDG) #MHBM74. ESD has evaluated the ESAT's Data Validation and agrees with ESAT's review of the data package. Data in the enclosed package are acceptable with the qualifiers added to the data reports. Please refer to the attached ICF Technology Inc. data validation report including the narrative summary and comments for a full explanation of the data review findings.

If you have any questions, or if I can be of further assistance, please contact me at 294-1055.

Attachments



Printed on Recycled Paper

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHBM90

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102_ SAS No.: _____ SDG No.: MHBM81

Matrix (soil/water): WATER

Lab Sample ID: 1875017___

Level (low/med): LOW___

Date Received: 05/19/94

% Solids: ___0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2310			F
7440-36-0	Antimony	13.0	U		F
7440-38-2	Arsenic	3.0	U		F
7440-39-3	Barium	79.1	B	E	F
7440-41-7	Beryllium	1.6	B		F
7440-43-9	Cadmium	3.0	U		F
7440-70-2	Calcium	25600			F
7440-47-3	Chromium	4.0	U		F
7440-48-4	Cobalt	5.0	U		F
7440-50-8	Copper	6.2	B		F
7439-89-6	Iron	3870		N	F
7439-92-1	Lead	15.3			F
7439-95-4	Magnesium	6030			F
7439-96-5	Manganese	245			F
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		F
7440-09-7	Potassium	2810	B		F
7782-49-2	Selenium	67.4			F
7440-22-4	Silver	2.0	U		F
7440-23-5	Sodium	13500			F
7440-28-0	Thallium	2.0	U		F
7440-62-2	Vanadium	4.0	U		F
7440-66-6	Zinc	40.6			F
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

mp 7/20/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHBM89

Lab Name: SOUTHWEST LAB OF OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM81

Matrix (soil/water): WATER_____ Lab Sample ID: 1875016_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	41.6	✓		P UJ
7440-36-0	Antimony	13.0	U		P UJ
7440-38-2	Arsenic	3.0	U		P UJ
7440-39-3	Barium	1.0	U	E	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	66.1	B		P UJ
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	5.0	U		P
7439-89-6	Iron	79.4	B	N	P J
7439-92-1	Lead	2.0	U		P
7439-95-4	Magnesium	16.0	U		P
7439-96-5	Manganese	2.0	U		P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	354	U		P
7782-49-2	Selenium	3.0	U		P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	80.1	✓		P UJ
7440-28-0	Thallium	2.4	✓		P UJ
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	9.3	B		P
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS_____ Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS_____ Clarity After: CLEAR_____ Artifacts: _____

Comments: _____

MP7/20/94

INORGANIC ANALYSES DATA SHEET

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

MHBM88

Lab Code: SWOK___ Case No.: 22102___ SAS No.: _____ SDG No.: MHBM81

Matrix (soil/water): WATER

Lab Sample ID: 1875015___

Level (low/med): LOW___

Date Received: 05/19/94

% Solids: ___0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	3530			P
7440-36-0	Antimony	13.0	U		P
7440-38-2	Arsenic	10.9			P
7440-39-3	Barium	138	B	E	P
7440-41-7	Beryllium	1.8	B		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	25300			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	10.1	B		P
7439-89-6	Iron	5820		N	P
7439-92-1	Lead	25.8			P
7439-95-4	Magnesium	5690			P
7439-96-5	Manganese	402			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	3300	B		P
7782-49-2	Selenium	64.9			P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	11100			P
7440-28-0	Thallium	7.2	X		P
7440-62-2	Vanadium	7.3	B		P
7440-66-6	Zinc	71.2			P
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS Clarity Before: CLEAR_ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_ Artifacts: _____

Comments:

HP 7/20/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHEM87

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_ SAS No.: _____ SDG No.: MHEM81

Matrix (soil/water): WATER

Lab Sample ID: 1875014_____

Level (low/med): LOW_____

Date Received: 05/19/94

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2310			P
7440-36-0	Antimony	13.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	62.1	B	E	P
7440-41-7	Beryllium	1.0	U		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	38800			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	8.2	B		P
7439-89-6	Iron	4250		N	P
7439-92-1	Lead	6.7			P
7439-95-4	Magnesium	7160			P
7439-96-5	Manganese	153			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	3420	B		P
7782-49-2	Selenium	86.5			P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	17700			P
7440-28-0	Thallium	5.9	B		P
7440-62-2	Vanadium	5.0	B		P
7440-66-6	Zinc	28.9			P
	Cyanide	500	U		CA
		10			

UJ
UJ

J

UJ

KJ 8/26/94

Color Before: COLORLESS Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_____ Artifacts: _____

Comments:

JHP 7/20/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHBM86

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM81

Matrix (soil/water): WATER_____ Lab Sample ID: 1875013_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2190			P
7440-36-0	Antimony	13.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	72.0	B	E	P
7440-41-7	Beryllium	1.4	B		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	26200			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	6.1	B		P
7439-89-6	Iron	3610		N	P
7439-92-1	Lead	10.0			P
7439-95-4	Magnesium	5670			P
7439-96-5	Manganese	219			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	2660	B		P
7782-49-2	Selenium	70.7			P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	13200			P
7440-28-0	Thallium	4.6	B		P
7440-62-2	Vanadium	6.0	B		P
7440-66-6	Zinc	37.4			P
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS_____ Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS_____ Clarity After: CLEAR_____ Artifacts: _____

Comments: _____

WP 7/20/94

INORGANIC ANALYSES DATA SHEET

MHBMS5

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBMS1

Matrix (soil/water): WATER_____ Lab Sample ID: 1875012_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: _____ 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2030			F
7440-36-0	Antimony	13.0	U		F
7440-38-2	Arsenic	3.0	U		F
7440-39-3	Barium	74.1	B	E	F
7440-41-7	Beryllium	1.1	B		F
7440-43-9	Cadmium	3.0	U		F
7440-70-2	Calcium	24500			F
7440-47-3	Chromium	4.0	U		F
7440-48-4	Cobalt	5.0	U		F
7440-50-8	Copper	6.6	B		F
7439-89-6	Iron	3300		N	F
7439-92-1	Lead	10.3			F
7439-95-4	Magnesium	5480			F
7439-96-5	Manganese	226			F
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		F
7440-09-7	Potassium	2690	B		F
7782-49-2	Selenium	66.0			F
7440-22-4	Silver	2.0	U		F
7440-23-5	Sodium	13000			F
7440-28-0	Thallium	2.0	U		F
7440-62-2	Vanadium	4.0	U		F
7440-66-6	Zinc	35.9			F
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS_____ Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS_____ Clarity After: CLEAR_____ Artifacts: _____

Comments: _____

MP 7/20/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHB84

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_ SAS No.: _____ SDG No.: MHB81

Matrix (soil/water): WATER

Lab Sample ID: 1875011_____

Level (low/med): LOW_____

Date Received: 05/19/94

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2120			F
7440-36-0	Antimony	13.0	U		F
7440-38-2	Arsenic	3.0	U		F
7440-39-3	Barium	74.3	B	E	F
7440-41-7	Beryllium	1.1	B		F
7440-43-9	Cadmium	3.0	U		F
7440-70-2	Calcium	24200			F
7440-47-3	Chromium	4.0	U		F
7440-48-4	Cobalt	5.0	U		F
7440-50-8	Copper	6.0	B		F
7439-89-6	Iron	3370		N	F
7439-92-1	Lead	9.8			F
7439-95-4	Magnesium	5480			F
7439-96-5	Manganese	228			F
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		F
7440-09-7	Potassium	2770	B		F
7782-49-2	Selenium	59.7			F
7440-22-4	Silver	2.0	U		F
7440-23-5	Sodium	12900			F
7440-28-0	Thallium	2.8	B		F
7440-62-2	Vanadium	4.0	U		F
7440-66-6	Zinc	34.4			F
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS Clarity After: CLEAR_____ Artifacts: _____

Comments:

hp 7/20/94

INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO. 004

MHBM83

Lab Name: SOUTHWEST LAB OF OK Contract: 68-D2-0040

Lab Code: SWOK Case No.: 22102 SAS No.: SDG No.: MHBM81

Matrix (soil/water): WATER Lab Sample ID: 1875010

Level (low/med): LOW Date Received: 05/19/94

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2080			F
7440-36-0	Antimony	13.0	U		F
7440-38-2	Arsenic	3.0	U		F
7440-39-3	Barium	79.7	B	E	F
7440-41-7	Beryllium	1.6	B		F
7440-43-9	Cadmium	3.0	U		F
7440-70-2	Calcium	23100			F
7440-47-3	Chromium	4.0	U		F
7440-48-4	Cobalt	5.0	U		F
7440-50-8	Copper	6.6	B		F
7439-89-6	Iron	3370		N	F
7439-92-1	Lead	9.8			F
7439-95-4	Magnesium	4770	B		F
7439-96-5	Manganese	250			F
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		F
7440-09-7	Potassium	2910	B		F
7782-49-2	Selenium	59.1			F
7440-22-4	Silver	2.0	U		F
7440-23-5	Sodium	11100			F
7440-28-0	Thallium	2.0	U		F
7440-62-2	Vanadium	4.0	U		F
7440-66-6	Zinc	35.3			F
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS Clarity Before: CLEAR Texture: _____

Color After: COLORLESS Clarity After: CLEAR Artifacts: _____

Comments:

MP7/20/94

1
INORGANIC ANALYSES DATA SHEET

EPA SAMPLE NO.

MHBMB2

Lab Name: SOUTHWEST LAB OF OK_____ Contract: 68-D2-0040

Lab Code: SWOK___ Case No.: 22102_ SAS No.: _____ SDG No.: MHBMB1

Matrix (soil/water): WATER

Lab Sample ID: 1875009___

Level (low/med): LOW___

Date Received: 05/19/94

% Solids: ___0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	2230			P
7440-36-0	Antimony	13.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	71.9	B	E	P
7440-41-7	Beryllium	1.6	B		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	23100			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	6.3	B		P
7439-89-6	Iron	3540		N	P
7439-92-1	Lead	9.6			P
7439-95-4	Magnesium	5380			P
7439-96-5	Manganese	215			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	2710	B		P
7782-49-2	Selenium	60.0			P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	14400			P
7440-28-0	Thallium	4.2	B		P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	35.1			P
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS

Clarity Before: CLEAR_

Texture: _____

Color After: COLORLESS

Clarity After: CLEAR_

Artifacts: _____

Comments:

JNP 7/30/94

INORGANIC ANALYSES DATA SHEET

MHBM81

Lab Name: SOUTHWEST_LAB_OF_OK_____ Contract: 68-D2-0040

Lab Code: SWOK_____ Case No.: 22102_____ SAS No.: _____ SDG No.: MHBM81

Matrix (soil/water): WATER_____ Lab Sample ID: 1875008_____

Level (low/med): LOW_____ Date Received: 05/19/94

% Solids: _____0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L_____

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum	1930			P
7440-36-0	Antimony	13.0	U		P
7440-38-2	Arsenic	3.0	U		P
7440-39-3	Barium	64.8	B	E	P
7440-41-7	Beryllium	1.2	B		P
7440-43-9	Cadmium	3.0	U		P
7440-70-2	Calcium	20100			P
7440-47-3	Chromium	4.0	U		P
7440-48-4	Cobalt	5.0	U		P
7440-50-8	Copper	6.4	B		P
7439-89-6	Iron	3080		N	P
7439-92-1	Lead	8.7			P
7439-95-4	Magnesium	4000	B		P
7439-96-5	Manganese	204			P
7439-97-6	Mercury	0.20	U		CV
7440-02-0	Nickel	11.0	U		P
7440-09-7	Potassium	2320	B		P
7782-49-2	Selenium	54.7			P
7440-22-4	Silver	2.0	U		P
7440-23-5	Sodium	9430			P
7440-28-0	Thallium	4.6			P
7440-62-2	Vanadium	4.0	U		P
7440-66-6	Zinc	28.0			P
	Cyanide	500	U		CA
		10			

Color Before: COLORLESS_____ Clarity Before: CLEAR_____ Texture: _____

Color After: COLORLESS_____ Clarity After: CLEAR_____ Artifacts: _____

Comments: _____

up 7/20/94

INORGANIC DATA QUALITY ASSURANCE REVIEW

REGION VIII

DATA QUALIFIER DEFINITIONS

For the purpose of Data Validation, the following code letters and associated definitions are provided for use by the data validator to summarize the data quality. Use of additional qualifiers should be carefully considered. Definitions for all qualifiers used should be provided with each report.

GENERAL QUALIFIERS for use with both INORGANIC and ORGANIC DATA

- R - Reported value is "rejected". Resampling or reanalysis may be necessary to verify the presence or absence of the compound.
- J - The associated numerical value is an estimated quantity because the Quality Control criteria were not met.
- U J - The reported amount is estimated because Quality Control criteria were not met. Element or compound was not detected.

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 12 - ICP LINEAR RANGES

ICP linear ranges were reported.

Yes X No

Comments: None

LINEAR RANGE VERIFICATION ANALYSIS

Linear Range Verification Analysis (LRA) was performed and results were within control limits of $\pm 5\%$ of the true value.

Yes No N/A X

Comments: None

FORM 13 - PREPARATION LOG

Information on the preparation of samples for analysis was reported on Form XIII.

Yes X No Not Required

Comment: None

FORM 14 - ANALYSIS RUN LOG

A Form XIV with the required information was filled out for each analysis run in the data package.

Yes X No Not Required

Comments: None.

Additional Comments or Problems/Resolutions (not addressed above).

Arsenic, lead, selenium, and thallium were analyzed by ICP. The arsenic, selenium, and thallium analytes were not present in the ICSAB solution.

In the mercury run on 5/23/94, pages 198 and 199, the laboratory cut out sequences 27 through 33, 36 through 45, 48 through 50, 60 through 65, and 68 through 70 from the raw data and taped together the remaining sequences. A run log was included, all necessary QC was included, and a time/date stamp demonstrated that all QC was analyzed appropriately; therefore, no qualifications were made.

INORGANIC DATA QUALITY ASSURANCE REVIEW

The serial dilution was without interference problems as defined by the SOW.

Yes ☐ No ☒

Comments: The following table lists the analytes with ICP serial dilution percent differences outside the control limits of ten percent with sample results >50XIDL, the initial sample and serial dilution results, the percent differences, and data qualifiers.

Element	INITIAL SAMPLE RESULT (ug/L)	SERIAL DILUTION RESULT (ug/L)	PERCENT DIFFERENCE	SAMPLES QUALIFIED - QUALIFIER
Barium	64.85	71.72	10.6	All samples except MHB89 - J

FORM 10 - QUARTERLY INSTRUMENT DETECTION LIMITS (IDL).

IDL's were provided for all elements on the target analyte list.

Yes ☐ No ☒

Comments: The laboratory did not provide an IDL for cyanide.

Reported IDL's met contract requirements.

Yes ☐ No ☒

Comments: The cyanide IDL was not provided with this data package. The CRDL for cyanide is 10 ug/L. The sample results were reported at 500 ug/L and the samples were not diluted for analysis.

FORM 11 - INTERELEMENT CORRECTION FACTORS FOR ICP

Interelement corrections for ICP were reported.

Yes ☒ No ☐ N/A ☐

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

For sample concentrations >5 times the CRDL, RPDs were within $\pm 20\%$ (limits of $\pm 35\%$ apply for soil/sediments/tailings samples).

Yes X No N/A

Comments: None

For sample concentrations <5 times the CRDL, duplicate analysis results were within the control window of \pm CRDL (2X CRDL for soils).

Yes X No

Comments: None

GFAA QC

GFAA analyses were not performed with this SDG.

FORM 7 - LABORATORY CONTROL SAMPLE

The laboratory control sample (LCS) was prepared and analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None

All results were within the control limits.

Yes X No

Comments: None

FORM 8 - STANDARD ADDITION RESULTS

GFAA analyses were not performed with this SDG.

FORM 9 - ICP QC

A serial dilution was performed for ICP analysis with every twenty or fewer samples of a similar matrix, or one per sample delivery group, whichever is more frequent.

Yes X No

Comments: None.

INORGANIC DATA QUALITY ASSURANCE REVIEW

Spike recoveries were within the range of 75 - 125% (an exception is granted where the sample concentration is 4 times the spike concentration).

Yes ☐ No ☒

Comments: The following table lists the spike recoveries outside control limits, matrix, samples affected, and data qualifiers.

ELEMENT	SPIKE RECOVERY	MATRIX	SAMPLES AFFECTED - QUALIFIERS
Iron	71.9%	Water	All Samples - J

FORM 5B - POST DIGEST SPIKE RECOVERY

A post-digest spike was performed for those elements that did not meet the specified criteria (i.e., Pre-digestion/pre-distillation spike recovery falls outside of control limits and sample result is less than four times the spike amount added, exception : Ag, Hg).

Yes ☒ No ☐ Not Required ☐

Comments: None

FORM 6 - DUPLICATE SAMPLE ANALYSIS

Duplicate sample analysis was performed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes ☒ No ☐

Comments: None

The RPDs were calculated correctly.

$$RPD = \frac{(S - D)}{(S + D)/2} \times 100$$

S = sample
D = duplicate

Yes ☒ No ☐

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

TYPE OF BLANK	ELEMENTS PRESENT, CONCENTRATION (ug/L)	SAMPLES AFFECTED - QUALIFIERS
CCB3	Thallium, 4.3	MHBM81, MHBM82, MHBM84 - UJ
CCB4	Thallium, 5.1	MHBM86, MHBM87, MHBM88, MHBM89 - UJ

FORM 4 - ICP INTERFERENCE CHECK SAMPLE

The ICP interference check sample (ICS) was run twice per eight hour shift and/or at the beginning and end of each sample set analysis sequence (whichever is more frequent).

Yes X No

Comments: None

Percent recovery of the analytes in solution ICSAB were within the range of 80-120%.

Yes X No

Comments: None

FORM 5A - MATRIX SPIKE SAMPLE ANALYSIS

A matrix spike sample was analyzed with every twenty or fewer samples of a similar matrix, or one per sample delivery group (whichever is more frequent).

Yes X No

Comments: None

The percent recoveries (%R) were calculated correctly.

$$\% \text{ Recovery} = \frac{(\text{SSR} - \text{SR})}{\text{SA}} \times 100$$

SSR = spiked sample result
SR = sample result
SA = spike added

Yes X No

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 3 - BLANKS

The initial and continuing calibration blanks (ICB and CCB, respectively) met contract requirements.

Yes X No

Comments: None

The continuing calibration blanks were run at 10% frequency.

Yes X No

Comments: None

A laboratory/preparation blank was run at the frequency of one per twenty samples, or per sample delivery group (whichever is more frequent), and for each matrix analyzed.

Yes X No

Comments: None

All analyzed blanks were free of contamination.

Yes No X

Comments: The following table lists the blanks with contamination, elements present, affected samples, and data qualifiers. Iron and selenium exhibited either positive or negative blank contamination above the absolute value of the IDL. However, all associated samples were either greater than five times the blank concentration or below the IDL; therefore, no action was taken on these elements.

TYPE OF BLANK	ELEMENTS PRESENT, CONCENTRATION (ug/L)	SAMPLES AFFECTED - QUALIFIERS
Preparation Blank	Aluminum, 49.1	MHBM89 - UJ
Preparation Blank	Antimony, -15.2	ALL - UJ
Preparation Blank	Arsenic, -6.2	All except MHBM88 - UJ, MHBM88 - J
CCB4	Arsenic, -5.7	MHBM88 - J
Preparation Blank	Calcium, 23.7	MHBM89 - UJ
Preparation Blank	Sodium, 74.1	MHBM89 - UJ

INORGANIC DATA QUALITY ASSURANCE REVIEW

FORM 2A - INITIAL AND CONTINUING CALIBRATION VERIFICATION

The initial and continuing calibration verification standards (ICV and CCV, respectively) met contract requirements.

Yes X No

Comments: None

The calibration verification results were within 90-110% recovery for metals, 80-120% for mercury, and 85-115% for cyanide.

Yes X No

Comments: None

The continuing calibrations standards were run at 10% frequency.

Yes X No

Comments: None

FORM 2B - CRDL STANDARD FOR ICP AND AA

ICP Analysis: Standards (CRI) at 2X the CRDL or the IDL whichever were greater, were analyzed at the beginning and the end of each sample run, or at a minimum of twice per eight hour shift, whichever was more frequent.

Yes X No

Comments: None

GFAA Analysis: Standards (CRA) at 2X CRDL were analyzed at the beginning of each sample run.

Yes X No

Comments: None

The CRI and/or the CRA were analyzed after the ICV.

Yes X No N/A

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

HOLDING TIMES

All CLP-SOW holding times were met.

Yes X No

All 40 CFR Part 136 holding times were met.

Yes X No

Comments: None

INSTRUMENT CALIBRATION: STANDARDS AND BLANKS

Initial instrument calibrations were performed according to contract requirements.

Yes X No

Comments: None

The instruments were calibrated daily and each time an analysis run was performed.

Yes X No

Comments: None

The instruments were calibrated using one blank and the appropriate number of standards.

Yes X No

Comments: None

FORM 1 - SAMPLE ANALYSIS RESULTS

Sample analyses were entered correctly on Form I's.

Yes X No

Comments: None

INORGANIC DATA QUALITY ASSURANCE REVIEW

SOW ILM02.1

RAS INORGANIC DELIVERABLES COMPLETENESS CHECKLIST

P Inorganic Cover Page
P Inorganic Analysis Data Sheets (Form I)
P Initial Calibration and Calibration Verification Results (Form II)
P Continuing Calibration Verification Results (Form II)
P CRDL Standard for ICP & AA (Form II, Part 2)
P Blank Analysis Results (Form III)
P ICP Interference Check Sample Results (Form IV)
P Spiked Sample Results (Form V)
P Post-digest Spiked Sample Analysis (Form V, Part 2)
P Duplicate Sample Results (Form VI)
P Instrument Detection Limits (Form VII) or (Form X - Quarterly)
P Laboratory Control Sample results (Form VII)
P Standard Addition Results (Form VIII)
P ICP Serial Dilution Results (Form IX)
NR Holding Times Summary Sheet (Form X)
P ICP Interelement Correction Factors (Form XII - Quarterly , or Form XI - Annually)
P ICP Linear Ranges (Form XII (XII) - Quarterly)
P Raw Data
 P Samples P Calibration Standards P Blanks P Spikes
 P Duplicates P ICP QC (ICS and Serial Dilution) P LCS
 NA Furnace AA P Mercury Analysis P Cyanide Analysis
NA Percent Solids Calculations - Solids Only
P Sample Prep/Digestion Logs (Form XIII)
P Analysis Run Log (Form XIV)
P Traffic Report(s)
P Chain of Custody
P Sample Description
NP Case Narrative
P Method References

KEY: P - Provided in original data package, as required by contract
 R - Provided as Resubmission
 NP - Not provided in original data package or as resubmission
 NR - Not required under contract
 NA - Not applicable to this data package

Comments: None.

INORGANIC DATA QUALITY ASSURANCE REVIEW

REVIEW NARRATIVE SUMMARY

This data package was reviewed according to the EPA document "USEPA CLP National Functional Guidelines for Evaluating Inorganic Data Review," February, 1994. The data package, Case 22102, SDG MHBM81, consisted of ten water samples for CLP RAS metals analyses.

The following table lists the data qualifiers added to sample analyses.

SAMPLE ID	ELEMENTS - QUALIFIERS	PROBLEM	REVIEW SECTION
MHBM89	Aluminum - UJ Sodium - UJ	Blank Contamination	Form 3
All Samples	Antimony - UJ	Negative Blank Contamination	Form 3
MHBM88	Arsenic - J	Negative Blank Contamination	Form 3
All Samples except MHBM88	Arsenic - UJ	Negative Blank Contamination	Form 3
MHBM89	Calcium - UJ	Blank Contamination	Form 3
MHBM81, MHBM82, MHBM84, MHBM86, MHBM87, MHBM88, MHBM89	Thallium - UJ	Blank Contamination	Form 3
All Samples	Iron - J	Matrix Spike	Form 5A
All samples except MHBM89	Barium - J	ICP Serial Dilution	Form 9

DATA QUALITY STATEMENT*

- () Data are ACCEPTABLE according to the Functional Guidelines with no qualifiers (flags) by the reviewer
(X) Data are acceptable with QUALIFICATIONS noted in review
() Data are UNACCEPTABLE according to the Functional Guidelines

Telephone/Communication Logs Enclosed? Yes ____ No X

TPO Attention Required? Yes X No ____

If yes, list the items that require attention: The laboratory did not provide an IDL for cyanide. The CRDL for cyanide is 10 ug/L. The sample results were reported at 500 ug/L and the samples were not diluted for analysis.

* Please see Data Qualifier Definitions, attached to the end of this report.

Heidi J. Phillips (303) 980-2032

REGION VIII
RAS INORGANIC - SUMMARY OF CLP DATA QUALITY ASSURANCE REVIEW

CASE/SAS/LGN NO.	SITE NAME	OPERABLE UNIT
22102	Gold Hill Tailings	8ZZ/00
RPM NAME	ESAT TID - 08-9404-423	
Pat Smith	ESAT WUD - 132	

CONTRACTOR LABORATORY	CONTRACT NO.	SDG	LABORATORY TPO/REGION
Southwest Laboratory of OK	68-D2-0040	MHBM81	Ray Flores/06

REVIEW ASSIGNED DATE 06/23/94 DATA REVIEWER Heidi J. Phillips REVIEW COMPLETION DATE 07/25/94

SAMPLE ID	SAMPLE LOCATION	MATRIX
MHBM81	GH-SW-1	Water
MHBM82	GH-SW-2	Water
MHBM83	GH-SW-3	Water
MHBM84	GH-SW-4	Water
MHBM85	GH-SW-5	Water
MHBM86	GH-SW-6	Water
MHBM87	GH-SW-7	Water
MHBM88	GH-SW-8	Water
MHBM89	GH-SW-9	Water
MHBM90	GH-SW-10	Water